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CONTENTS

The American Association for the Advancement of Science:—
Race Problems in America: PROFESSOR FRANZ BOAS 839

The International Congress of Applied Chemistry 849

The Summer Meeting of the American Chemical Society: PROFESSOR CHARLES L. PARSONS 850

Formation of the Joint Committee on the Unification of Methods of Analysis of Fats and Oils 851

The Puget Sound Marine Station 851

The Biological Station of the University of Michigan 851

Scientific Notes and News 852

University and Educational News 855

Discussion and Correspondence:—
Some New Data on the Professor's Financial Position: J. G. COFFIN. *Fair Play and Toleration in Science:* PROFESSOR T. J. J. SEE 855

Scientific Books:—
Annals of the Astronomical Observatory of Harvard College: PROFESSOR R. DEC. WARD. *Bulletins of the American Museum of Natural History:* L. P. GRATACAP 861

Special Articles:—
Radium in Spiral Nebulæ and in Star Clusters: DR. MONROE B. SNYDER. *Observations on the Shifting of the Channel of Missouri River:* H. B. DUNCANSON. *The Proper Name of the American Eel:* B. A. BEAN .. 865

The American Association for the Advancement of Science:—
Section L—Education: PROFESSOR C. R. MANN 872

The Entomological Society of America: J. CHESTER BRADLEY 873

Societies and Academies:—
The Michigan Academy of Science: PROFESSOR ALEXANDER G. RUTHVEN 877

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RACE PROBLEMS IN AMERICA[1]

THE development of the American nation through amalgamation of diverse European nationalities and the ever-increasing heterogeneity of the component elements of four people have called attention to the anthropological and biological problems involved in this process.

I propose to discuss here these problems with a view of making clear the hypothetical character of many of the generally accepted assumptions. It will be our object to attempt a formulation of the problems, and to outline certain directions of inquiry, that promise a solution of the questions involved, that, at the present time, can not be answered with scientific accuracy. It is disappointing that we have to accept this critical attitude, because the events of our daily life bring before our eyes constantly the grave issues that are based on the presence of distinct types of man in our country, and on the continued influx of heterogeneous nationalities from Europe. Under the pressure of these events, we seem to be called upon to formulate definite answers to questions that require the most painstaking and unbiased investigation. The more urgent the demand for final conclusions, the more needed is a critical examination of the phenomena and of the available methods of solution.

Let us first represent to our minds the facts relating to the origins of our nation. When British immigrants first flocked to the Atlantic coast of North America, they found a continent inhabited by Indians. The population of the country was thin,

[1] Address of the vice-president and chairman of Section H, American Association for the Advancement of Science, Baltimore, 1908.

and vanished comparatively rapidly before the influx of the more numerous Europeans. The settlement of the Dutch on the Hudson, of the Germans in Pennsylvania, not to speak of other nationalities, is familiar to all of us. We know that the foundations of our modern state were laid by Spaniards in the Southwest, by French in the Mississippi Basin and in the region of the Great Lakes, but that the British immigration far outnumbered that of other nationalities. In the composition of our people, the indigenous element has never played an important rôle, except for very short periods. In regions where the settlement progressed for a long time entirely by the immigration of unmarried males of the white race, families of mixed blood have been of some importance during the period of gradual development, but they have never become sufficiently numerous in any populous part of the United States to be considered as an important element in our population. Without any doubt, Indian blood flows in the veins of quite a number of our people, but the proportion is so insignificant that it may well be disregarded.

Much more important has been the introduction of the negro, whose numbers have increased many fold so that they form now about one eighth of our whole nation. For a certain length of time the immigration of Asiatic nations seemed likely to become of importance in the development of our country, but the political events of recent years have tended to decrease their immediate importance considerably; although we do not venture to predict that the relation of Asiatics and white Americans may not become a most important problem in the future. These facts, however, are familiar to all of us and stand out clearly to our minds.

More recent is the problem of the immigration of people representing all the nationalities of Europe, western Asia and northern Africa. While until late in the second half of the nineteenth century the immigrants consisted almost entirely of people of northwestern Europe, natives of Great Britain, Scandinavia, Germany, Switzerland, Holland, Belgium and France, the composition of the immigrant masses has changed completely since that time. With the economic development of Germany, German immigration has dwindled down; while at the same time Italians, the various Slavic peoples of Austria, Russia and the Balkan Peninsula, Hungarians, Roumanians, east European Hebrews, not to mention the numerous other nationalities, have arrived in ever-increasing numbers. There is no doubt that these people of eastern and southern Europe represent a physical type distinct from the physical type of northwestern Europe; and it is clear, even to the most casual observer, that their present social standards differ fundamentally from our own. Since the number of new arrivals may be counted in normal years by hundreds of thousands, the question may well be asked, What will be the result of this influx of types distinct from our own, if it is to continue for a considerable length of time?

It is often claimed that the phenomenon of mixture presented in the United States is unique; that a similar intermixture has never occurred before in the world's history; and that our nation is destined to become what some writers choose to term a "mongrel" nation in a sense that has never been equaled anywhere.

When we try to analyze the phenomena in greater detail, and in the light of our knowledge of conditions in Europe as well as in other continents, this view does not seem to me tenable. In speaking of European types, we are accustomed to consider them as, comparatively speaking, pure stocks. It is easy to show that this view

is erroneous. It is only necessary to look at a map illustrating the racial types of any European country—like Italy, for instance—to see that local divergence is the characteristic feature, uniformity of type the exception. Thus Dr. Ridolfo Livi, in his fundamental investigations on the anthropology of Italy, has shown that the types of the extreme north and of the extreme south are quite distinct—the former tall, short-headed, with a considerable sprinkling of blond and blue-eyed individuals; the latter short, long-headed and remarkably dark. The transition from one type to the other is, on the whole, quite gradual, but, like isolated islands, distinct types occur here and there. The region of Lucca in Tuscany and the district of Naples are examples of this kind, which may be explained as due to the survival of an older stock, to the intrusion of new types, or to a peculiar influence of environment.

Historical evidence is quite in accord with the results derived from the investigation of the distribution of modern types. In the earliest times we find on the peninsula of Italy groups of heterogeneous people, the linguistic relationships of many of which have remained obscure up to the present time. From the earliest prehistoric times on, we see wave after wave of people invading Italy from the north. Very early Greeks settled in the greater part of southern Italy and Phœnician influence was well established on the west coast of the peninsula. A lively intercourse existed between Italy and northern Africa. Slaves of Berber blood were imported and have left their traces. Slave trade continued to bring new blood into the country until quite recent times, and Livi believes that he can trace the type of Crimean slaves who were introduced late in the Middle Ages in the region of Venice. In the course of the centuries, the migrations of Celtic and Teutonic tribes, the conquests of the Normans, the contact with Africa, have added their share to the mixture of people on the Italian peninsula.

The fates of other parts of Europe were no less diversified. The Pyrenæan Peninsula, which at present seems to be one of the most isolated parts of Europe, had a most checkered history. The earliest inhabitants of whom we know were presumably related to the Basques of the Pyrenees. These were subjected to Oriental influences in the Pre-Mycenæan period, to Punic influences, to Celtic invasions, Roman colonization, Teutonic invasions, the Moorish conquest, and later on to the peculiar selective process that accompanied the driving-out of the Moors and the Jews.

England was not exempt from vicissitudes of this kind. It seems plausible that at a very early period the type which is now found principally in Wales and in some parts of Ireland occupied the greater portion of the islands. It was swamped by successive waves of Celtic, Roman and Anglo-Saxon migration. Thus we find change everywhere.

The history of the migrations of the Goths, the invasions of the Huns, who in the short interval of one century moved their habitations from the borders of China into the very center of Europe, are proofs of the enormous changes in population that have taken place in early times.

Slow colonization has also brought about fundamental changes in blood as well as in diffusion of languages and cultures. Perhaps the most striking recent example of this change is presented by the gradual Germanization of the region east of the Elbe River, where, after the Teutonic migrations, people speaking Slavic languages had settled. The gradual absorption of Celtic communities, of the Basque, in ancient times the great Roman colonization,

and later the Arab conquest of north Africa, are examples of similar processes.

Intermixture in early times was not by any means confined to peoples which, although diverse in language and culture, were of fairly uniform type. On the contrary, the most diverse types of southern Europe, northern Europe, eastern Europe and western Europe, not to mention the elements which poured into Europe from Asia and Africa, have been participants in this long-continued intermixture.

There is, however, one fundamental difference in regard to the early European migrations and the modern trans-Atlantic migration. On the whole, the former took place at a period when the density of population was, comparatively speaking, small. There is no doubt that the number of individuals concerned in the formation of the modern types of Great Britain were comparatively few as compared with the millions who come together to form a new nation in the United States; and it is obvious that the process of amalgamation which takes place in communities that must be counted by millions differs in character from the process of amalgamation that takes place in communities that may be counted by thousands. Setting aside social barriers, which in early times as well as now undoubtedly tended to keep intermingling peoples separate, it would seem that in the more populous communities of modern times a greater permanence of the single combining elements might occur, owing to their larger numbers, which make the opportunities for segregation more favorable.

Among the smaller communities the process of amalgamation must have been an exceedingly rapid one. After the social distinctions have once been obliterated, pure descendants of one of the component types decrease greatly in number, and the fourth generation of a people consisting originally of distinct elements will be almost homogeneous. I shall revert to this phenomenon later on.

It might be objected to this point of view, that the very diversity of local types in Europe proves the homogeneity of race types—as, for instance, of the northwestern European type, the Mediterranean type, the east European type, or the Alpine type; but it must be remembered that we have historical proof of the process of mixture, and that the relative number of component elements is sufficient to account for the present conditions.

I think we may dismiss the assumption of the existence of a pure type in any part of Europe, and of a process of mongrelization in America different from anything that has taken place for thousands of years in Europe. Neither are we right in assuming that the phenomenon is one of a more rapid intermixture than the one prevailing in olden times. The difference is based essentially in the masses of individuals concerned in the process.

If we confine our consideration for the present to the intermixture of European types in America, I think it will be clear, from what has been said before, that the concern that is felt by many in regard to the continuance of racial purity of our nation is to a great extent imaginary. The history of Europe proves that there has been no racial purity anywhere for exceedingly long periods, neither has the continued intermixture of European types shown any degrading effect upon any of the European nationalities. It would be just as easy to prove that those nations that have been least disturbed have lacked the stimulus to further advance and have passed through periods of quiescence. The history of Spain might be interpreted as an instance of an occurrence of this kind.

The question as to the actual effects of intermixture will not, however, be an-

swered by a generalized historical treatment such as we have attempted here. The advocates of the theory of a degradation of type by the influx of so-called "lower" types will not be silenced by reference to earlier mixtures in Europe, the course of which can no longer be traced in actual detail for we do not know to what extent actual intermarriages have taken place, and what the development of families of mixed descent as compared with those of pure descent has been. It seems necessary that the problem should be approached from a biological standpoint. It seemed well, however, to gain first a clearer view of the historical relations of our problem. A knowledge of the events of the past tends to lay our apprehensions, that make the problem exciting, and which for this reason fill the observer with a strong bias for the results which he fears or desires.

Two questions stand out prominently in the study of the physical characteristics of the immigrant population. The first is the question of the influence of selection and environment in the migration from Europe to America. The second is the question of the influence of intermixture. A beginning of a thorough study of the former question was made as early as the time of the civil war, when Gould and Baxter, in their statistics of the enlisted soldiers, proved that the immigrant representatives of European nations were always better developed than the corresponding people in Europe. It has not been possible, up to the present time, to learn whether this difference is due to better development here or to a process of selection, by which the weaker elements are eliminated before leaving their home country. It would be easy to ascertain the facts by an investigation of the arriving immigrants. That there is good reason to suppose that more favorable social surroundings in the United States have much to do with the better development of the immigrants is proved by the anthropometrical statistics collected by Bowditch in Boston and by Peckham in Milwaukee, who found that the children growing up in America are better developed than European children. Although much additional material has been collected on the old lines, the fundamental questions which are involved in this investigation have never received adequate attention. Statistics which I had occasion to collect recently seem to show that the development of children of immigrants is the better the longer their parents have been in the United States. I presume this merely suggests that the economic well-being of the immigrants increases, on the whole, with the length of their stay here, and that the corresponding better nutrition of the children results in better physical development. Whether, however, the whole change can be explained adequately in this manner is open to doubt. It is quite possible that the type may undergo certain changes due to environment.

In how far types must be considered as stable is a question in regard to which there is still considerable diversity of opinion. Investigators like Kollmann maintain the absolute stability of the types now existing; while, on the other hand, indications are not absent which suggest a changeability of types, at least in certain respects. It would seem that stature may be considerably influenced by long-continued more or less favorable environment. There are investigators who maintain that the more or less energetic use of the jaws may influence the form of the head, owing to the pressure brought about by the muscles, which tend to compress the skull laterally. On the other hand, we have very clear evidence that features, like the form of the head, the form of the face and stature, are inherited from generation to

generation with great persistence. As long as these questions are still so far from being settled, it seems necessary to take into consideration the possibility of a change of type in the immigrants, due to the new surroundings in which they have been placed. Some anthropologists in America have even gone so far as to claim that the geographical environment affects the European in such a way that he begins to resemble the Indian type. I have failed to find, so far, even a trace of evidence on which this opinion can be based.

The only indication that I can offer which might suggest an influence of environment is an observation which I made a number of years ago in Massachusetts, where I found that the variability of type was remarkably low, considering the mixed composition of the population—a variability which is less than the corresponding values obtained in Europe. But a sporadic observation of such a character is, of course, entirely insufficient to solve a problem of this magnitude. It would seem to my mind that one of the most important and fundamental investigations that have to be made in regard to the question of the biological assimilation of immigrants is a thorough discussion of the sameness or change of type of the second and third generations.

It has often been observed that the local types which have developed in America show a considerable amount of individualization. Some of this may very well be due to the influence of environment. It might be, for instance, that the tallness of the people of Kentucky is due to the lime-water of that area. This would be in accord with the observations made by Rœse in Gotha, who found that the stature in that city had changed with the introduction of hard water. It will certainly be possible to carry through this inquiry among a people like the Italians or Swedes, where the anthropometrical conditions of the home country are fairly well known, while for many other nationalities parallel inquiries in Europe and in America would be necessary. Even if, by extended inquiries into the physical characteristics of the descendants of immigrants, the modifications of their type should become well known, the problem would still remain. In how far do these types increase in a pure state after their migration, in how far do they tend to become extinct, and what tendency they have to mix with the rest of the population. It seems best to defer a discussion of this question until after consideration of the influence of race intermixture.

Here we may consider again the physical effect of intermixture and the propagation of mixed types independently. I regret to say that the available information in regard to this point is, if anything, more meager than that relating to the modification of types after their migration into this country. The fundamental question that must be asked is, whether the mixture of two distinct types of man tends to produce an intermediate homogeneous type in which certain of the characteristics of the parents appear blended, or whether the resultant tends to exhibit reversion to the parental types. This reversion may again be twofold. We may either find a complete reversion to one of the component parental types, or we may find a mixture of traits, some resembling the one parent, some the other parent. Obviously this question is most intimately related to the whole study of Mendelian inheritance, which occupies such a prominent place in the work of modern biologists. So far, the results obtained from a study of human types are few in number. I believe the earliest observation in regard to this subject was made by Felix von Luschan, who found as early as 1884 that the inhabitants of the south coast of

Asia Minor, who are the descendants of intermarriages between a short-headed type of the central parts of Asia Minor and of the long-headed south coast type—a mixture which has continued for thousands of years—show clear evidence of alternating inheritance. In 1895 I was able to show (utilizing fairly extended observations) that the mixed blood resulting from unions of American Indians and whites shows, in regard to certain traits, a clear tendency to reversion to either parental type; while in other respects (for instance, in stature) new characteristics seem to develop. A recent inquiry into heredity among east European Jews shows that here also the children show a tendency to revert either to the father's or to the mother's type. This result is interesting, because it bears upon unions inside of a fairly uniform type of man. Other observations relate to the inheritance of abnormal traits, all of which seem to suggest, if not true Mendelism, at least the occurrence of alternating inheritance. However, the observations on mixtures of Indian and white have shown that while alternating inheritance may be found in regard to such traits as the form of the head and face, the development of the bulk of the body follows different laws. Notwithstanding these observations, the whole problem of the effects of race intermixture upon the various characteristic traits of human types is entirely unsolved.

It is not too much to say that the whole work in this field remains to be done. We do not know what weight to give to the small differences of types such as are found in Europe, and whether these differences are sufficiently great to be considered important as compared with the differences between individuals of the same geographical type but belonging to opposite ends of the local series. We must not forget that the people of Europe in each locality are very variable, and that we may find (for instance, in Scotland) considerable numbers of individuals who will differ from one another more than do the average individuals of, let me say, Scotland and southern Italy. The question of the effects of intermixture of types can, therefore, not be treated entirely separately from the question of intermarriages among people belonging to the same locality. And it is worth considering whether the remoteness of blood relationship in different parts of Europe, as compared to the closer blood relationship inside of a narrow territory, may not outweigh all the influences of the differences of geographical types. The whole question seems to be most complex, and worthy of the most detailed and thorough study; but I do not venture to predict the anatomical and physiological effects of intermixture without a most painstaking investigation, which has not been made up to this time.

Considering our lack of knowledge of the most elementary facts that determine the outcome of these processes, I feel that it behooves us to be most cautious in our reasoning, and particularly to refrain from all sensational formulations of the problem, that are liable to add to the prevalent lack of calmness in its consideration; the more so since the answer to these questions concerns the welfare of millions of people.

The problem is one in regard to which speculation is as easy as accurate studies are difficult. Basing our arguments on ill-fitting analogies with the animal and plant world, we may speculate on the effects of intermixture upon the development of new types—as though the mixture that is taking place in America were in any sense, except a sociological one, different from the mixtures that have taken place in Europe for thousands of years; looking for a general degradation, for re-

version to remote ancestral types, or towards the evolution of a new ideal type—as fancy or personal inclination may impel us. We may enlarge on the danger of the impending submergence of the northwest European type, or glory in the prospect of its dominance over all others. Would it not be a safer course to investigate the truth or fallacy of each theory rather than excite the public mind by indulgence in the fancies of our speculation. That these are an important adjunct in the attainment of truth, I do not deny; but they must not be promulgated before they have been subjected to a searching analysis, lest the credulous public mistake fancy for truth.

If I am not in a position to predict what the effect of mixture of distinct types may be, I feel confident that this important problem may be solved, if it is taken up with sufficient energy and on a sufficiently large scale. An investigation of the anthropological data of people of distinct types—taking into consideration the similarities and dissimilarities of parents and children, the rapidity and final result of the physical and mental development of children, their vitality, the fertility of marriages of different types and in different social strata—such an investigation is bound to give us information which will allow us to answer these important questions definitely and conclusively.

The final result of race mixture will necessarily depend upon the fertility of the present native population and of the newer immigrants. It has been pointed out repeatedly that the birth-rate of Americans has declined with great rapidity, and that in the second and third generations of immigrants the same decline makes itself felt. It will therefore be important to know what the relation of fertility of different types may be.

If the fertility of foreigners continues high without a corresponding higher death-rate of children, we may anticipate a gradual increase of the physical influence of the more fertile type. The immigration of the divergent types of southern and eastern Europe is, however, so recent, that this question can not be answered until at least twenty years more have elapsed.

No less important than the fertility of each immigrant type by itself is the question, in how far they tend to intermarry. The data presented in our census reports do not give a clear insight into this tendency among various nationalities. The difficulties of collecting significant statistics on the problem are very great. They appear particularly clear in the case of Italians. Married men from Italy come to the United States, earn some money, and go back to rejoin their families. They may come again, and, when conditions are propitious, they may finally send for their families to follow them. Thus we find among the Italian immigrants very large numbers who were married before they came here. It seems almost impossible to separate the contingent of couples married before their arrival here from those married after their arrival, and the chief point of interest to us lies in the intermarriages of children born in this country. It is natural that in large cities, where nationalities separate in various quarters, a great amount of cohesion should continue for some time; but it seems likely that intermarriages between descendants of foreign nationalities are much more common than the census figures would make it appear. Our experience with Americans whose grandparents immigrated into this country is, on the whole, that most social traces of their descent have disappeared, and that many do not even know to what nationalities their grandparents belonged. It might be expected—particularly in Western communities, where a rapid change of location

is common—that this would result in a rapid mixture of the descendants of various nationalities. This inquiry, which it is quite feasible to carry out in detail, seems indispensable for a clear understanding of the situation.

It is somewhat difficult to realize how rapidly intermixture of distinct types takes place, if the choice of mates is left entirely to accident. I have made this calculation; and I find that in a population in which two types intermingle, and in which both types occur with equal frequency, there will be in the fourth generation less than one person in ten thousand of pure descent. When the proportion of the two original types is as nine to one, there will be among the more numerous part of the population only eighteen in one thousand in the fourth generation that will be of pure blood. Taking these data as a basis, it is obvious that intermixture, as soon as the social barriers have been removed, must be exceedingly rapid; and I think it safe to assume that one hundred years from now, in the bulk of our population, very few pure descendants of the present immigrants will be found.

Unfortunately, however, we do not know the influence of racial cohesion. Obviously this is one of the fundamental points that ought to be known in order to gain a clear insight into the effect of recent immigration. The data collected by our census and by other agencies do not contain this information, which is one of the most urgent desiderata for an understanding of the composition of the American population. I may therefore express the hope that this question may be included in the census to be organized next year, or may be otherwise provided for by an inquiry to be undertaken under the auspices of the government. Without this information, the whole discussion of the effect of intermixture will remain speculative.

No material whatever is available to answer the question whether mixture of types is favorable for the physical development of the individual, or unfavorable. Statistics collected in the Argentine Republic tend to show that with a mixture of similar types, but from remote countries, considerable changes in the proportions of the sexes develop. Observations on half-breed Indians show that a type taller than either parental race develops in the mixed blood; that the fertility of the mixed blood is increased; and I can not find any evidence that would corroborate the view, so often expressed, that the hybrid of distinct types tends to degenerate.

I have refrained entirely from a discussion of the social problem, which is no less important than the one referring to the physical types of the descendants of immigrants; and I do not intend to include this question in our consideration, which is devoted to the anthropological problem only.

I have also devoted attention essentially to the biological problems presented by the immigration of European nations, but I must not conclude my remarks without referring at least to the serious problem presented by the negro population of our country. When compared with the contrast between the negro and the white, the differences of the European types seem insignificant; and the unity of the European race, as contrasted with the negro race, becomes at once apparent.

I do not intend to take up the whole question of racial inferiority, which can not be treated adequately in the brief time that I can devote to this subject. I must confine myself to a statement of my opinion, which I have repeatedly tried to substantiate. I do not believe that the negro is, in his physical and mental make-up, the same as the European. The anatomical differences are so great that corresponding mental differences are plausible. There may exist

differences in character and in the direction of specific aptitudes. There is, however, no proof whatever that these differences signify any appreciable degree of inferiority of the negro, notwithstanding the slightly inferior size, and perhaps lesser complexity of structure, of his brain; for these racial differences are much less than the range of variation found in either race considered by itself. This view is supported by the remarkable development of industry, political organization, and philosophic opinion, as well as by the frequent occurrence of men of great will-power and wisdom among the negroes in Africa.

I think we have reason to be ashamed to confess that the scientific study of these questions has never received the support either of our government or of any of our great scientific institutions; and it is hard to understand why we are so indifferent towards a question which is of paramount importance to the welfare of our nation. The anatomy of the American negro is not well known; and, notwithstanding the oft-repeated assertions regarding the hereditary inferiority of the mulatto, we know hardly anything on this subject. If his vitality is lower than that of the full-blooded negro, this may be as much due to social causes as to hereditary causes. Owing to the very large number of mulattoes in our country, it would not be a difficult matter to investigate the biological aspects of this question thoroughly; and the importance of the problem demands that this should be done. Looking into a distant future, it seems reasonably certain that with the increasing mobility of the negro, the number of full-bloods will rapidly decrease; and since there is no introduction of new negro blood, there can not be the slightest doubt that the ultimate effect of the contact between the two races must necessarily be a continued increase of the amount of white blood in the negro community. This process will go on most rapidly inside of the colored community, owing to intermarriages between mulattoes and full-blooded negroes. Whether or not the addition of white blood to the colored population is sufficiently large to counterbalance this leveling effect, which will make the mixed bloods with a slight strain of negro blood darker, is difficult to tell; but it is quite obvious, that, although our laws may retard the influx of white blood considerably, they can not hinder the gradual progress of intermixture. If the powerful caste system of India has not been able to prevent intermixture, our laws, which recognize a greater amount of individual liberty, will certainly not be able to do so; and that there is no racial sexual antipathy is made sufficiently clear by the size of our mulatto population. A candid consideration of the manner in which intermixture takes place shows very clearly that the probability of the infusion of white blood into the colored population is considerable. While the large body of the white population will always, at least for a very long time to come, be entirely remote from any possibility of intermixture with negroes, I think that we may predict with a fair degree of certainty a condition in which the contrast between colored people and whites will be less marked than it is at the present time. Notwithstanding all the obstacles that may be laid in the way of intermixture, the conditions are such that the persistence of the pure negro type is practically impossible. Not even an excessively high mortality and lack of fertility among the mixed type, as compared with the pure types, could prevent this result. Since it is impossible to change these conditions, they should be faced squarely, and we ought to demand a careful and critical investigation of the whole problem.

It appears from this consideration, that

the most important practical questions relating to the negro problem have reference to the mulattoes and other mixed bloods—to their physical types, their mental and moral qualities, and their vitality. When the bulky literature of this subject is carefully sifted, little remains that will endure serious criticism; and I do not believe that I claim too much when I say that the whole work on this subject remains to be done. The development of modern methods of research makes it certain that by careful inquiry, definite answers to our problems may be found. Is it not, then, our plain duty to inform ourselves that, so far as that can be done, deliberate consideration of observations may take the place of heated discussion of beliefs in matters that concern not only ourselves, but also the welfare of millions of negroes?

Facts that could help us to shape our policies in regard to our race problems are almost entirely wanting. It has been my endeavor to show that by proper investigations much can be done to clear up these problems, which are of vital importance for the future of our nation.

FRANZ BOAS

COLUMBIA UNIVERSITY

THE INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY

WE take from the London *Times* some facts in regard to the seventh International Congress of Applied Chemistry, which will be opened at the Albert Hall, London, on May 27.

Previous congresses have been held in Brussels in 1894, in Paris in 1896 and 1900, in Vienna in 1898, in Berlin in 1903 and in Rome in 1906; this is therefore the first occasion on which Great Britain has been visited. The work of the congress has grown steadily, and its importance is realized all over the world. There is ample evidence of the interest taken in Great Britain, where in addition to Royal patronage the congress has received the support of several of the heads of the government departments who have become honorary vice-presidents. Sir Henry Roscoe, F.R.S. and Sir William Ramsay, F.R.S., are honorary president and acting president, respectively.

For some considerable time an organizing committee has been making the arrangements for the congress and has had the support, as vice-presidents, of the presidents of the Royal Society, the Society of Chemical Industry, the Institute of Chemistry, the Institute of Brewing, the Society of Dyers and Colorists, the Pharmaceutical Society, and the Society of Public Analysts, Sir William Abney, F.R.S., Sir Hugh Bell, Professor P. F. Frankland, Dr. J. Lewkowitsch, Dr. L. Mond, F.R.S., Dr. E. K. Muspratt, Sir Boverton Redwood, Mr. W. F. Reid, Mr. A. Gordon Salamon and Professor W. A. Tilden, F.R.S. The committee is a large one and includes in addition to representatives of the organizations already named members of the Royal Societies of Edinburgh and Dublin, the Royal Society of Arts, the Iron and Steel Institute, the Institution of Mining Engineers, the Institution of Mining and Metallurgy, the International Association of Leather Chemists, the Royal Agricultural Society of England, the Lawes Agricultural Trust, the Royal Photographic Society, the Faraday Society and the London Chamber of Commerce (Chemical Trade Section), with Mr. William MacNab as honorary secretary. In connection with this committee local committees are formed in the principal centers of the British Isles and foreign countries and the colonies with a view to furthering the interests of the congress.

The work of the congress covers a wide field, as is shown by the large number of sections into which it is divided, as follows: (1) Analytical Chemistry (president, Dr. T. E. Thorpe, C.B., F.R.S.); (2) Inorganic Chemistry and Allied Industries (Dr. Ludwig Mond, F.R.S.); (3) Metallurgy and Mining. Explosives—(*a*) Metallurgy and Mining (Sir Hugh Bell), (*b*) Explosives (Sir Andrew Noble, F.R.S.); (4) Organic Chemistry and Allied Industries—(*a*) Organic Products (Professor W. H. Perkin, F.R.S.), (*b*) Coloring Substances and their Uses (Professor Meldola, F.R.S.);(5)

Industry and Chemistry of Sugar (Mr. Richard Garton); (6) Starch Industry—(*a*) Starch Industry (Dr. Horace T. Brown, F.R.S.), (*b*) Fermentation (Mr. John Gretton, M.P.); (7) Agricultural Chemistry (Lord Blyth); (8) Hygiene, Medical and Pharmaceutical Chemistry. Bromatology—(*a*) Hygiene and Medical Chemistry (Sir J. Crichton Browne, F.R.S.), (*b*) Pharmaceutical Chemistry (Mr. N. H. Martin), (*c*) Bromatology (Mr. Robert R. Tatlock, F.I.C.); (9) Photographic Chemistry (Sir William Abney, F.R.S.); (10) Electrical and Physical Chemistry (Sir John Brunner, M.P.); (11) Law, Political Economics and Legislation with reference to Chemical Industries (Lord Alverstone).

The sections will meet in the buildings of the University of London and the Imperial College of Science and Technology each day of the congress from 10 o'clock to 1:30 (except on the closing day), and on May 31 and June 1, from 4 to 6. On the evening of Wednesday, May 26, the day before the official opening, the mayor and the corporation will hold a reception of the delegates at the Guildhall. The prince of Wales will open the congress at the inaugural meeting to be held at the Royal Albert Hall on May 27, at 3 o'clock, and in the evening of that day a reception will be held by the foreign office. At 2:30 on Friday, May 28, lectures will be delivered to the whole congress by Professor Haller, of Paris, and Professor Paterno, of Rome, and at Crystal Palace in the evening a banquet will be held, at which it is expected a large number will be present. A garden party will be held at the Botanic Gardens on Saturday, May 29, by the ladies' committee, which has been formed, under the presidency of Lady Ramsay, for the purpose of entertaining the ladies accompanying the members; and later in the day a reception will be held by the London section of the Society of Chemical Industry at the University of London. On Monday, May 31, Professor Otto de Witt, of Berlin, will give a general lecture at 2:30, and at the same hour on the following day, June 1, Sir Boverton Redwood is announced to deliver a lecture to the whole congress. In the evening of Tuesday, June 1, a reception will be held at the Natural History Museum. The official closing of the congress will take place at a meeting held at 10 o'clock on June 2. In the afternoon members will, by permission of the King, visit Windsor Castle.

The offices of the honorary general secretary, Mr. William MacNab, are at the Imperial College of Science and Technology, South Kensington.

THE SUMMER MEETING OF THE AMERICAN CHEMICAL SOCIETY

The summer meeting of the American Chemical Society will, as already announced, be held in Detroit, Mich., on June 29 to July 2, inclusive. On the previous day a business meeting of the council will be held. The meetings of the sections and divisions will be held on Tuesday and Wednesday, June 29 and 30, and on Friday, July 2, in the Central High School, which has ample facilities.

On Tuesday evening a complimentary smoker will be given by the Society of Detroit Chemists to the members of the American Chemical Society.

On Wednesday afternoon the members will inspect the works of Parke, Davis & Co., to be followed by a lunch and a moonlight boat-ride on the Detroit River, complimentary to the visiting chemists from this firm.

On Thursday the members will take special cars to the University of Michigan at Ann Arbor, where they will be the guests of the University of Michigan for the day, returning to Detroit in the evening for the usual banquet. The program will be continued on Thursday at the University of Michigan and will consist mainly of special papers of wide general interest.

On Friday the sectional and divisional programs will be continued and excursions taken to manufacturing plants in Detroit.

The headquarters for the meeting will be at the Hotel Pontchartrain. Details in regard to this hotel and other hotels in Detroit may be obtained by addressing the secretary. It is suggested by the local committee that it is very necessary to make hotel reservations in

advance, as Detroit is liable to be crowded at this time.

Special arrangement is being made for the entertainment of ladies who accompany members.

CHARLES L. PARSONS,
Secretary

DURHAM, N. H.

FORMATION OF THE JOINT COMMITTEE ON THE UNIFICATION OF METHODS OF ANALYSIS OF FATS AND OILS

AT the last meeting of the Association of Official Agricultural Chemists, held in November, 1908, a committee of three was appointed to join with a similar committee, if such could be appointed, from the American Chemical Society and the American Society for Testing Materials, the object being to try to bring about uniformity in the methods of these three great chemical societies, and also that this joint committee should represent this country in the formation of an international commission upon this same subject.

The committee appointed by the Association of Official Agricultural Chemists consisted of Mr. L. M. Tolman, chairman, Mr. Percy H. Walker and Mr. A. Lowenstein. The committee from the American Chemical Society consisted of Mr. A. H. Gill, chairman, Mr. David Wesson and Mr. C. E. Waters. The committee appointed by the American Society for Testing Materials consisted of Mr. C. N. Forrest, chairman, Mr. Jerome Frank and Mr. G. W. Thompson. These three committees have united into the formation of a joint committee, Mr. Tolman being elected chairman, and Mr. Forrest, secretary.

The work of this joint committee is to bring about as far as possible a uniformity in methods of analysis and statement of results. The first meeting was held in New York at the Chemists' Club on May 25, for the consideration of plans of work, and of carrying them on.

THE PUGET SOUND MARINE STATION

A LABORATORY for the study of marine biology has been established by the State University, the State College and the three State Normal Schools of Washington in cooperation. This is located on the islands of the lower Puget Sound, a region unapproachable for its wealth of marine life. For the session 1909 the laboratory will be maintained at Friday Harbor on San Juan Island from June 21 until July 10, and at Olga on Orcas Island from July 12 until July 31. The following courses are announced: Exploratory Zoology, C. T. Brues, curator of the Milwaukee Public Museum; Invertebrate Zoology, H. S. Brode, professor of biology, Whitman College; Vertebrate Zoology, A. D. Howard, professor of zoology, University of Washington; Insects, A. L. Melander, professor of entomology, Washington State College; Molluscs, James L. Kellogg, professor of zoology, Williams College; Fishes, E. C. Starks, curator, Stanford University; Phylogeny of Plants, Charles E. Bessey, professor of botany, University of Nebraska; Cryptogamic Botany, Charles O. Chambers, professor of biology, Pacific University; Systematic Botany, R. K. Beattie, professor of botany, Washington State College; Ecology, T. C. Frye, professor of botany, University of Washington; Algæ, Mabel R. Simpson, professor of biology, University of Puget Sound.

The equipment of the station will include a steam dredging outfit, motor launch, scows, boats, etc. Microscopes and usual apparatus will be supplied. Tuition is free, but a laboratory privilege charge of ten dollars will be made for the six weeks courses. The Alaska-Yukon-Pacific Exposition at Seattle will afford an unusual opportunity of visiting the Pacific coast at low cost.

An invitation to make the station their headquarters is cordially extended to eastern biologists. Every opportunity will be given for the collection and study of the interesting species of Puget Sound. Correspondence may be addressed to Professor T. C. Frye, University, Seattle, or to Professor A. L. Melander, Pullman, Washington.

THE BIOLOGICAL STATION OF THE UNIVERSITY OF MICHIGAN

A STATION for instruction and research in biology will be maintained by the University

of Michigan, as a part of its regular summer session, during the eight weeks from June 28 to August 20 inclusive, 1909.

The station will be located near the Bogardus Engineering Camp of the university on a tract of about 1,700 acres of land owned by the university and stretching from Douglas Lake to Burt Lake in Cheboygan County, Michigan, seventeen miles south of the Straits of Mackinaw. This region, diversified by hills and valleys, was formerly covered by primeval forest, and vestiges of this still remain. It contains many lakes of clear water, unsurpassed in the state for size, depth and beauty of setting. The elevation of the camp, between two and three hundred feet above Lake Michigan, insures cool nights and makes the location favorable for hay fever sufferers. The topography of the region immediately about the Bogardus Camp is such as to afford a variety of floral and faunal conditions.

It is not the purpose of the station to duplicate the work offered at the university, but to provide facilities for field work of a sort that can not be so well carried on at the university or under the limitations imposed by a university schedule.

The courses of instruction will include: The natural history of vertebrate animals, freshwater special work and research in zoology, teachers' course in ecology, identification of trees and shrubs, botanical survey of the Bogardus Camp region, and research in ecology. Professor Reighard, head of the department of zoology, and Dr. George P. Burns, assistant professor of botany in the University of Michigan, will be in charge of these courses.

Not more than twenty students can be accommodated, and no registration will be accepted if received after June 10. Applications should be addressed to Professor E. H. Kraus, secretary of the Summer Session, Ann Arbor, Mich.

SCIENTIFIC NOTES AND NEWS

Mr. Oakes Ames has been appointed director of the Botanic Garden of Harvard University.

Dr. R. R. Gates, of the University of Chicago, has accepted a position in the Missouri Botanical Garden, where he will devote himself to continuing his cytological experiments and breeding experiments with *Œnothera*.

Dr. R. P. Verneau has been appointed to the professorship of anthropology in the Paris Museum of Natural History in succession to the late Professor Hamy.

Dr. Chalmers Mitchell, secretary of the London Zoological Society, will reside at the gardens when the society's library and offices are transferred there. Under him there will eventually be three curators, one each for mammals, birds and reptiles. Mr. R. I. Pocock, who is to retain his present post of garden-superintendent, will have charge of the mammals, and temporarily of the reptiles, while Mr. D. Seth-Smith is to take over the custody of the birds, combining with this duty the office of inspector of works.

Dr. Frederic Ward Putnam, Peabody professor of American archeology and ethnology in Harvard University, has resigned from active service. It will be remembered that Professor Putnam celebrated his seventieth birthday on April 16.

Professor Viktor von Lang has retired from the chair of experimental physics at Vienna.

A portrait of Dr. James Law, the first director of the Veterinary College of Cornell University, has been presented to the college as a gift of the New York state alumni. The presentation was made by Dr. G. S. Hopkins, and the portrait was accepted on behalf of the university by President Schurman. Addresses were delivered by ex-President White and Director Moore.

The faculty of the Massachusetts Institute of Technology at the last regular faculty meeting of the year adopted the following resolution by a unanimous rising vote:

Resolved, That the members of the faculty of the Massachusetts Institute of Technology desire to express to Dr. Arthur A. Noyes, upon his concluding his work as acting president, their deep

sense of the service he has rendered by his admirable executive ability, his power of initiative, his untiring labor, his unfailing tact and his contagious enthusiasm. Under his skilful management a period which might easily have been one of discouragement and detriment has been marked by distinct and constant advance in the affairs of the school, and by the inception and progress of new and excellent measures in its administration. They also wish to declare their admiration for the unselfishness with which he has laid aside for the time being the original work in which he has gained such distinction, in order to devote his energy to the interests of the institute as a whole; and they thank him for the kindly and helpful spirit which has marked all his relations toward them, both official and personal.

The students have presented Dr. Noyes with a loving cup bearing an inscription as follows:

Presented to Dr. Arthur A. Noyes by the undergraduates of the Massachusetts Institute of Technology in gratitude for his faithful and efficient service, his warm-hearted sympathy and his unselfish devotion as acting president, 1907–1909.

WE are glad to learn that Dr. Edgar F. Smith, head of the department of chemistry and vice-provost of the University of Pennsylvania, has resumed academic duties after a long illness.

PROFESSOR JULIUS WIESNER has been elected a corresponding member of the Paris Academy of Sciences in the section of botany.

THE Royal Scottish Geographical Society has decided to award its Livingstone gold medal for the current year to Lieutenant Shackleton for his exploration in the Antarctic.

LIVERPOOL UNIVERSITY has conferred its doctorate of science on Mr. Francis Darwin and Professor J. L. Todd; its doctorate of engineering on the Hon. C. A. Parsons, and its doctorate of laws on Sir Donald Macalister and Mr. William Marconi.

DR. CHARLES W. ELIOT will give the commencement address at the University of Missouri on June 2, at the same time the doctorate of laws will be conferred on him.

MCGILL UNIVERSITY, of Montreal, intends to confer the honorary degree of LL.D. on Dr. George A. Gibson, of Edinburgh, at the medical convocations on June 9. Dr. Gibson gave the inaugural address before the medical faculty of the university on September 22, 1908, his subject being "The Limits of Knowledge."

FOR the superintendence of the investigations at the National Physical Laboratory and for general advice on the scientific problems arising in connection with the work of the British Admiralty and War Office in aerial construction and navigation, a special committee has been appointed, which includes the following: President, the Right Hon. Lord Rayleigh, O.M., F.R.S.; chairman, Dr. H. T. Glazebrook, F.R.S. (director, National Physical Laboratory); Major-General Sir Charles Hadden, K.C.B. (representing the army), Captain R. H. S. Bacon, R.N., C.V.O., D.S.O. (representing the navy), Sir Alfred G. Greenhill, F.R.S., Dr. W. N. Shaw, F.R.S. (director, the Meteorological Office), Mr. Horace Darwin, F.R.S., Mr. H. R. A. Mallock, F.R.S., Professor J. E. Petavel, F.R.S., and Mr. F. W. Lanchester.

DR. L. O. HOWARD, chief of the bureau of entomology and permanent secretary of the American Association for the Advancement of Science, is in Europe to continue his study of parasites with which the ravages of the gypsy moth may be checked.

PROFESSOR N. E. GILBERT, of Dartmouth College, will spend a large part of the next year in study and investigation at the Cavendish Laboratory, Cambridge, England.

THE Senckenberg Natural History Society has awarded the Sömmerring prize to Dr. Paul Krämer, of Vienna, for his work on the inheritance of artificially produced reproductive adaptations.

PROFESSOR R. M. YERKES, of Harvard University, addressed the Scientific Association of the Johns Hopkins University on May 12 upon the "Scientific Method in the Study of Comparative Psychology," showing the importance of applying quantitative methods in the investigation of its phenomena.

Professor Taav. Laitinen, M.D., professor of hygiene and director of the Hygienic Institute in the University of Helsingfors, and chairman of the Finnish National League of Health, will deliver the third Norman Kerr Memorial lecture on July 20, in the lecture theater of the Victoria and Albert Museum, London. The subject will be "The Influence of Alcohol on Immunity."

The Harben lectures of the Royal Institute of Public Health, London, will be delivered this year by Professor R. Pfeiffer, director of the Hygienic Institute, Breslau, in the lecture room of the institute.

The directorship of the Pathological Institute of the New York State Commission in Lunacy is to be filled by civil service examination. Candidates must meet the following requirements: Five years' residence in a large public or private hospital for the insane; five years' experience as a successful instructor in neuropathology or psychiatry, or as chief of clinic; familiarity with German, French and English; familiarity with the insanity law of New York State and the administration of the department under the Commission in Lunacy; evidence of original research shown by contributions to clinical psychiatry, pathological anatomy of the nervous system, experimental psychology, etc. All submitted papers must be properly authenticated and reach the State Civil Service Commission on or before June 19. Candidates should give in their applications detailed information concerning their training and experience, especially in the lines mentioned. Subjects of examination and relative weights: psychiatry and psychopathology, 3; neurology and neuropathology, 3; experience and special training, 4. The salary of the position is $6,500.

The councilors of the American Geographical Society have accepted Mrs. Collis P. Huntington's gift of a $250,000 site for a new building at Broadway and 153d Street, New York City, overlooking the Hudson River. Mr. Archer M. Huntington, the president of the society, has given $50,000 toward the building fund, which will be increased by further subscriptions and the proceeds of the sale of the old building, which should be about $250,000.

The two-ton iron meteorite found in 1908 near Tonopah, Nevada, has recently been presented to the Field Museum of Natural History through the generosity of Messrs. Stanley Field, Richard T. Crane, Jr., Cyrus H. McCormick and George F. Porter.

The London *Times* states that Dr. Rendle, keeper of the botanical department of the British Museum (Natural History) at South Kensington, has just completed the rearrangement of the botanical gallery of that museum. The main series of exhibits represents the great plant groups with their families, including flowering plants, ferns, mosses, seaweeds and fungi. The groups are illustrated by pictures, specimens and models. The series of exhibits illustrating the British flora is rapidly approaching completion. The drawings of the larger British fungi are complete. The trustees, it may be mentioned, have just issued a handbook giving descriptions of all known British species illustrated by line drawings of the genera. There is a very interesting series of actual specimens of the larger fungi found near London, mostly on Wimbledon-common. These have been prepared in such a way as to show the structure. The British flowering plants, ferns and mosses are displayed in frames in such a way as to be easy of reference. This collection is intended not so much for the expert botanist as for the amateur who may wish to identify specimens without being under the necessity of a prolonged search in the great herbarium of the museum. Some volumes of illustrations of British plants are also available for consultation by the public. They are a recent acquisition, having been given by the artist, Miss E. N. Gwatkin. The lichens of Britain have been arranged in two cabinets, with descriptions and original drawings. The collection also contains cases illustrating points in the biology of plants, the fertilization of flowers, insect-eating flowers, parasitic plants, plants from dry countries, climbing plants and others. A case showing the abnormalities of leaves, flowers and fruits has also been arranged.

IT has been estimated that the amount of wood annually consumed in the United States at the present time is twenty-three billion cubic feet, while the growth of the forest is only seven billion feet. In other words, Americans all over the country are using more than three times as much wood as the forests are producing. The figures are based upon a large number of state and local reports collected by the government and upon actual measurements. The state forester of Connecticut, in a recent report, has given figures on growth and use for New Haven County, which give more details than are generally to be obtained, and illustrate how the forest is being reduced by over-cutting. In this county a very careful study was made on each township of the amount of forest, the rate of growth, and the amount of timber used. For the year 1907 the timber used was 120,000 cords, in the form of cordwood, lumber, ties, poles and piles. The annual growth on all types of forest land, including the trees standing on abandoned fields, for the year, reached a total of 70,000 cords. Thus the amount cut yearly exceeds the growth by 50,000 cords. The amount of standing timber considered as merchantable and available for cutting within the next few years was found to be 1,200,000 cords. Each year the annual growth increases the supply on hand by 70,000 cords, while the use decreases it by 120,000. The net reduction is therefore 50,000 cords a year. If the cut and the growth remain at the present figures, the supply of merchantable timber will be exhausted in about twenty years. At the end of that time there will be a large amount of forest standing in the county, but it will be in tracts under forty years of age, containing wood below the most profitable size for cutting. Cordwood could still be cut, but supplies of the most profitable products, like ties and lumber, would be practically exhausted.

UNIVERSITY AND EDUCATIONAL NEWS

MRS. MORRIS K. JESUP has given Yale University $100,000 to establish the Morris K. Jesup chair of agriculture in the Forestry School. The university has also received $50,000 for the School of Fine Arts and $50,000 for a memorial gateway.

DR. W. G. FROST, president of Berea College, announces that an industrial school for negroes will be established near Shelbyville, Ky., and the erection of buildings will be begun in a short time. A railroad station and a post office for the school will be established, called Lincoln, Ky. The endowment, largely given by Mr. Andrew Carnegie, amounts to $350,000.

THE University of Pennsylvania has asked the city of Philadelphia to transfer to it sixty-one acres of land adjoining the grounds of the institution in return for fifty free scholarships. The land wanted extends east to the Schuylkill River.

THE Goldsmith Company has given £50,000 to the Imperial College of Science and Technology, London, for a building extending the engineering department.

THE Bristol Town Council has decided to contribute in the proportion of one penny in the pound on the rate, or about £7,000 per annum, towards the support of the proposed university for Bristol and the west of England, for which more than £200,000 has been subscribed, mainly by members of the Wills family.

DR. EDWARD L. EARP has resigned his position as professor of sociology at Syracuse University to accept the chair of Christian sociology at Drew Theological Seminary, Madison, N. J.

MR. T. H. LABY has been appointed to the chair of physics in Victoria College, Wellington, New Zealand.

DR. M. CUTTA, associate professor in the Technological School at Munich, has been called to a chair of applied mathematics in the University of Jena.

DISCUSSION AND CORRESPONDENCE

SOME NEW DATA ON THE PROFESSOR'S FINANCIAL POSITION

A TEACHER on entering the profession generally tacitly assumes that after a certain

length of time of greater or lesser duration, and upon evidence of ability and progress along required lines, that promotion and salary will come of themselves.

That the expectation is small and that the realization is still smaller is a fact which soon impresses itself upon all in the teaching profession.

From personal observation, I believe that many are enticed into the career of teaching without due regard as to the discouraging pecuniary future, and I wish to suggest that all those desiring to teach be carefully made to see what the future has in store for them.

A teacher's salary is notably smaller than that which men of the same or even lesser ability obtain in other occupations; but I believe that teachers, as a class, have considered this but of small consequence and are not, as a class, envious of the far greater incomes of most of those with whom they meet in a social way.

They come under the class of salaried men who take no risks and hence do not share in the excess profits. A distinguished sociologist on my enquiry as to the position of the professor in the sociological order answered "You are all parasites." To a great measure this is correct, we are parasites, happily useful ones, but still parasites.

We are resigned to our fate; but lately some facts have come to my notice that have aroused my sense of justice and made me view with much less equanimity the low financial position of the teacher.

I have before me an authoritative manuscript by Colonel H. O. S. Heistand, of the Adjutant General's Department, U. S. Army, entitled "The United States Army as a Career."

The following extract is the portion which excites these feelings and also others which I believe most of those that read will have in common with me:

THE ARMY AS A CAREER

Let us see what the enlisted man is able to do in the way of accumulating a competence to provide for the declining years of his life.

If he has been an improvident spendthrift throughout his entire career and has not saved a penny, he will have as long as he lives his retired pay, which at the very least is equal in value to a paid-up insurance policy of from $10,000 to $20,000, non-forfeitable and guaranteed by the government. But a careful man would save half his cash pay when all necessaries are provided, and let us see what would be the result if he did so.

If he has remained a private soldier—the very lowest position in the army—during his entire twenty-five or thirty years' service, without ever having received any "extra-duty" pay or other special increase, and has saved and deposited with the government one half of his pay, and the amounts due him on discharge each time he reenlists, he finally quits the active list with the snug sum of more than $9,000, the income of which at four per cent. would yield over $30 per month; this added to his retired pay gives him a monthly income of nearly $65 per month for the rest of his life, and he is free to go wherever and occupy himself as he pleases.

Please notice that in this case and in the following cases the men own their capital and may withdraw it to go into business; and also that they are still comparatively young, that is, between 43 and 50 years of age, assuming that they enlisted between the ages of 18 and 25 years.

But for a soldier to remain a private so long is almost impossible; such a condition could result only from excessive indolence or a degree of stupidity that would seem to be a bar to original or subsequent enlistment. A fair supposition and one easy of realization would be that of a soldier who remains a private half of his first enlistment, then becomes a corporal; is made a sergeant upon reenlistment, and remains a sergeant the remainder of his career. Such a soldier, saving as above, would receive on final discharge nearly $15,000, this amount at four per cent. together with his retired pay would give him a monthly income of over $100 for the remainder of his life.

If instead of remaining a sergeant he reaches the grade of first sergeant and holds that position during the last nine years of his service, he will have saved about $16,000, which at four per cent. will yield an amount, which added to his retired pay, gives him over $120 per month. If the soldier is a private during his first enlistment, a sergeant in his second and third enlistments and then becomes a non-commissioned staff officer, say a commissary sergeant, his savings of one half

his pay, etc., as above, will amount to over $18,000 and with his retired pay will provide him an income of about $130 per month.

But even this by no means exhausts the possibilities of a career in the ranks of the army. For, if, say during the first three enlistments the soldier diligently applies himself to study in the army schools which are provided for him and advances sufficiently to become a master electrician, or if he have a musical turn and become a chief musician or sergeant in the band, his savings at the date of retirement will be just short of $24,000 and his total monthly income will be almost exactly $170.

None of the above cases are exceptions—all are within easy realization of the enlisted man who enters the army for a life business with a determination to succeed and prosper. Furthermore, at the date of retirement he will be in the prime of life and able to add to his capital and income for many years. Observation leads to the belief that very few laboring men or mechanics achieve a measure of success equal even to that possible for the soldier who remains a private during his entire career, and the easy possibility of the higher grades exceeds the average of success of the learned professions.

Men in business and professional life may contemplate a greater measure of success than this, but in doing so the great majority of them indulge only in pleasant dreams which are never realized. They suffer the dangers of fire, bank failures, industrial depressions and all the other enemies of success against which the professional soldier has the integrity and permanency of the government to protect him.

If the soldier does not desire to remain in the army for the full period of thirty years, he may quit at the expiration of any enlistment period, or he may purchase his discharge at any time after one year's service if he be not undergoing punishment or is not on duty at or under orders for duty at a foreign station; and if he chooses to save his money he will have between $300 and $400 at the end of a single enlistment. Surely he will not have wasted his time. After twenty years' service he may enter the Soldier's Home which is maintained by the federal government in the District of Columbia, and there spend his days in comfort.

Inquiry elicited the facts, which were to be expected, that a very similar outlook encouraged the *enlisted* man in the navy.

It seems to us that these extracts speak for themselves. The only requirements of admission of a man to all of these possibilities is simply that he be of sound body, of good moral character and be able to read and write English (?).

In comparison with what is required of the college professor the teaching profession has not a tenth of similar advantages to offer.

We can not retire without losing all claim to a pension, if we do so before a certain large number of years of service have passed.

The average teacher retires an old man after his energies have been used up in the furtherance of the public good that repays him so meagerly.

The pension, when it is obtained, is not nearly so large, in most cases, as that received by the soldier who, besides, *owns* a goodly part of the contributing capital.

All this is about the *enlisted* man. The officers have, of course, a more remunerative future before them.

The young cadet on graduation receives a minimum salary of $1,700 as second lieutenant. If he becomes first lieutenant or captain, which may occur very shortly, or at least the salaries of which grades he may receive shortly, his salary rises to $2,000 and $2,400 respectively. The salary of a major is $3,000. All salaries are subject to a ten per cent. increase every five years for twenty years if promotion should by any accident not take place long before that period is ended.

Besides these amounts the officers are allowed quarters and light for themselves and families and the privilege of obtaining all supplies at wholesale rates through the commissary department.

When in course of duty the officer must reside outside of the army post, the government allows him an extra amount called commutation of quarters, of respectively $24 per month for second lieutenants, $36 per month for first lieutenants, $48 to captains, the amounts increasing by $12 a month for each grade.

Adding this to the nominal salary and a percentage saving of one fifth or twenty per cent. in the cost of provisions, we have the totals for a newly graduated cadet or second

lieutenant, about $2,300, for a first lieutenant about $2,800, for a captain about $3,400. These are all low grades in the army.

What teacher receives anything approaching this on graduation from a college or even on receiving a doctor's degree after six more arduous years of hard study?

The salary on graduation of a Massachusetts Institute of Technology man as assistant is $500, with an increase to $600 the next year. It may in some institutions reach as high as $1,000, but that is exceptional.

A common soldier may reasonably look forward to retirement at the age of 45 or 50 years, with a life-long income of $2,040, and the opportunities to devote himself to a congenial pursuit.

One feels a certain amount of chagrin in meeting casually on a train an enlisted naval petty officer younger than himself who has $12,000 saved in the bank.

Why must the teaching profession be forever in such an unfortunate financial position in comparison with other callings? Have we not, as a class, enough common interest, enough moral courage to wage a campaign together for what is justly due us, for our labors? That is, a reasonable salary sufficient for our needs, sufficient for our family, sufficient to maintain the responsible and honorable position we now hold and which would in the event of a just increase become of much more influence in public life.

J. G. Coffin

FAIR PLAY AND TOLERATION IN SCIENCE

To the Editor of Science: I have read with surprise, if not indignation, Professor Blackwelder's discussion of Lowell's "Mars as the Abode of Life" in your issue of April 23, 1909; and feel that it is only just to enter a protest, in the interest of fair play and that degree of toleration which has always been characteristic of the better men of science. Professor Blackwelder speaks as if some great injury had been done to the public by the appearance of a popular book, written in a narrative style adapted to the lay demand. Of course this is wholly untrue, and mere idle vaporing. Lowell's popular works are all better than Proctor's and Flammarion's, and both of these latter writers have done valuable service in diffusing the results of scientific research among the multitude. It may sound very plausible to the scientific recluse to say that nothing but mathematical formulæ and tables are of value, but every well-informed man knows better. It is by the popularization of science that new interest is awakened in the public mind and increased opportunities provided for the extension of scientific research.

To take a specific example, it was the reading of a popular work by Huyghens, entitled "Comotheoros," which led Dr. Plume to establish the Plumian professorship of astronomy at Cambridge, which has been held by such distinguished mathematicians as Sir George Darwin, who has greatly extended our knowledge of mathematical astronomy, yet is not so narrow as to deny the value of popular science, but on the contrary has contributed to it by popular articles in magazines and a standard work on the tides.

If we compare the present state of astronomy in the United States with that in other countries, we shall be compelled to admit that American preeminence is due very largely to popular interest, and a general appreciation of results. Without popular diffusion of the results of scientific research, who among our business men and captains of industry could possibly have any interest in scientific work? In this day of specialization even scientific workers find it difficult to understand the labors of others, and the public is at vastly greater disadvantage. I make great use of logarithms, trigonometry and calculus, but I have yet to see the laymen who enthuse over columns of figures or complicated mathematical analysis.

When Proctor was living he was assailed by the self-appointed critics in much the same way as Lowell is now; but they always forget that there are others to be considered besides the mere priesthood of science. It sometimes seems to me that some of the latter are almost as intolerant as those divinely inspired persons who took it upon themselves to conduct

the inquisition during the middle ages. For one, I am not at all prepared to admit the justice of contemporary criticism, though in the long run a moderate and just opinion will prevail. This has been true in all ages and professions, and therefore is not confined to our own time or to any particular science.

Now as to some of the points cited by Professor Blackwelder as objectionable:

1. He finds fault with Lowell for adhering to Laplace's cosmogony; but let me point out that this same cosmogony very slightly modified, to take account of tidal friction, has been held by the most eminent mathematicians abroad.[1] If such views have been held by those who have spent many years on the subject, at such mathematical centers as Cambridge, England, surely Lowell may be excused for not accepting the inconsistent and purely destructive criticisms recently put forth at Chicago by Chamberlin and Moulton. It is only fair to say that no constructive results of consistent character had been reached on this subject till my own investigation was completed last year, of which an account is given in *Astronomische Nachrichten,* No. 4308 (February, 1909), but which appeared too late to be used in Lowell's book. As I have worked on this subject uninterruptedly for twenty-five years, I am prepared to speak with some degree of authority. If Professor Blackwelder will study my last paper carefully, and the work now in press, when it appears, he will find that most of the recent speculations on cosmogony are not worth the paper they are written on; and yet some of them have been published by the *Astrophysical Journal* and the Carnegie Institution, just as other erroneous and misleading papers have often been published by the Royal Society, the Paris Academy of Sciences and other learned societies of standing. Every experienced investigator recognizes the great amount of error that creeps into scientific literature even of the best type. How much more latitude, therefore, is to be expected in popular literature, which in the nature of the case must be entertaining rather than strictly exact and ultra-conservative!

2. Great fault is found with Lowell's claim that in general the terrestrial continents have been formed from the interior outwards, though he justly cites Dana, one of the greatest geologists of any age, in support of this view. Now I venture to say that Professor Blackwelder has not read carefully the four memoirs recently published in the *Proceedings of the American Philosophical Society* at Philadelphia, in which I have examined this question and the related topics with great care; otherwise he would see that, however deficient our knowledge may be as to details, in general his contentions are absolutely without foundation. In the opinion of many eminent men of science, including some of the foremost geologists and physicists, who have done me the honor to read these papers, I have proved that mountains are formed by the sea, and not at all by the shrinkage of the globe; and as the younger mountains are generally nearest the oceans it follows that the oceans are gradually drying up and the land increasing, as Lowell maintains. Therefore Lowell is right, and Blackwelder wrong; and that too in a subject which he represents as his own. Dana and Le Conte clearly understood that the mountains are related to and have in some way risen from the sea, but on the old contraction theory, now happily abandoned, they could form no correct conception of the cause of mountain formation. If Professor Blackwelder is prepared to contest my results, let him answer my argument on mountain formation in the case of the Aleutian Islands, where I have proved that they are a submarine mountain range now being pushed up by matter expelled from beneath the trench dug out in the sea bottom to the south of these islands; and that the whole movement is due to the secular leakage of the ocean and the resulting expulsion of lava beneath the crust, and nothing else. On this point other geologists have discreetly kept silent, but perhaps Professor Blackwelder "will rush in where angels fear to tread."

[1] Cf. paper by Mr. F. J M. Stratton, on "Planetary Inversion," in the *Monthly Notices* of the Royal Astronomical Society, April, 1906.

3. Now in regard to life on Mars, it is sufficient to say that Professor Newcomb has justly remarked that the physical conditions on that planet are very similar to those prevailing in the Himalayas of Central Asia. But even the tableland of Tibet is inhabited, and maintains a respectable civilization. As Lowell has proved that there are water and clouds on Mars, and the polar snows melt and disappear with the advance of the summer seasons on that planet, why may there not be life there as well as here? Of course there is life on Mars; there is no doubt about it. But I am not prepared to say how far advanced the creatures on Mars may be; neither am I narrow enough to deny the possibility of their high development.

Perhaps it will interest Professor Blackwelder and others to know that I have just sent to the *Astronomische Nachrichten* and to the American Philosophical Society extracts from a letter of Euler, written in 1749, and published in the *Philosophical Transactions* of the Royal Society, before the cosmogonic theories of Kant (1755) and Laplace (1796) were put forward, in which the great Swiss mathematician, then residing at Berlin, even went so far as to say that the planets had gradually neared the sun from a great distance—thus implying that the earliest life originated on these bodies in the depths of space, before they came anything like so near the sun as they now are. Arrhenius holds a similar view to-day, and even thinks that life is carried by germs from one world to another.[2] In the work now in press, it is shown, on new grounds, that all the fixed stars are attended by systems of planets. Is Professor Blackwelder prepared to claim that all these billions of worlds are uninhabited? If not, why is he so unreasonable about the habitability of Mars? Lowell's view that there is life in the other worlds is sure to triumph, and we had as well come to it one time as another.

4. Professor Blackwelder is sure that Lowell is working for "a certain notoriety and a brief but undeserved credence for his pet theories." Let us, in common fairness, have no assignment of motives. These are seldom known in any man, either by himself or by others. If Professor Blackwelder is as candid as he wishes others to be, he will now come forward and say that there is much yet to be learned in every branch of science, including geology, and about contemporary scientific investigators as well, and that according to the best ethics, every tree must be judged by its fruit.

Lowell has maintained for fifteen years a magnificent observatory, which has carried on valuable work on Mars, and the other planets and satellites; on double stars, both visual and spectroscopic; on the spectra of the outer planets; on comets and meteoric phenomena; on meteorology as related to the best sites for observatories; and on many other topics. He has given many young astronomers a chance to do good independent work, and the results obtained are highly valued throughout the world. What has Professor Blackwelder done in comparison? And is he the one to say that censure can not be too severe upon one who has deserved so well of American men of science as Professor Lowell has done? Let the still voice of conscience answer! Emerson says that alone all men are conscientious. If so, we shall have a little more toleration, and fair dealing, and less of this clique and faction business, by which a man who is not in the ring never can get justice or fair consideration. Of all the evils which afflict American science to-day the wide-spread tendency to partizanship and factionism and the resulting total disregard of the ultimate interests of truth, is undeniably the worst. As the truth is difficult to discover, and in the end will be found only among the errors of the wise, it is clear that every cause must be heard, and we must preserve a tolerant and open-minded attitude towards all contemporary work. Recent revolutions in all branches of science have been so great that no man knows, and no honest man will attempt to predict, what a day may bring forth.

T. J. J. See

U. S. Naval Observatory,
Mare Island, California,
April 30, 1909

[2] Cf. "Worlds in the Making," *Harper's*, 1908.

SCIENTIFIC BOOKS

Annals of the Astronomical Observatory of Harvard College, Edward C. Pickering, Director. Vol. LVIII., Part III. Observations and Investigations made at the Blue Hill Meteorological Observatory, Massachusetts, U. S. A., in the Year 1905, Under the Direction of A. LAWRENCE ROTCH. With Summaries of Observations for the Lustrum and for the Twenty Years, a Discussion of them, Memoirs on the Meteorology of Total Solar Eclipses and on the Eclipse Shadow-Bands, and a Bibliography. 4to. Cambridge, 1908. Pp. 147–228. Pls. I.–II.

The same. Vol. LXVIII., Part I. Exploration of the Air with Ballons-sondes at St. Louis, and with Kites at Blue Hill. By H. HELM CLAYTON and S. P. FERGUSSON.

The work of the Blue Hill Observatory, whether it be the routine observations or the original investigations carried on by members of the staff, has always been of the highest grade of accuracy, interest and importance. The publications which have dealt with this work, both those in the regular series of the *Annals of the Harvard College Observatory,* and those which have appeared in various scientific journals, make up a list which includes some of the very best contributions to meteorology. Without Professor Rotch's generous and whole-souled support of the Blue Hill Observatory, and without the steady, careful and devoted work of himself and of his assistants, American meteorology would not occupy the important position in the world of science which it does occupy to-day. This statement can be made with perfect truth, and without in any way whatever disparaging the excellent work which has been, and is being, carried on by the United States Weather Bureau.

To review, adequately, the two volumes now before us is wholly out of the question in a journal in which meteorology necessarily has to occupy a subordinate position. We can only note the most important matters presented in these publications.

1. The first number of the *Annals* contains the 1905 observations, both surface and upper air, together with summaries of the observations at the ground during the preceding lustrum and the twenty years. As Professor Rotch points out in his introduction, there is probably nowhere else in the United States so homogeneous a series of observations, due to unchanged exposure of the instruments and methods of reading them. This, alone, gives these records considerable importance. The principal climatic features of the twenty-year period are, therefore, at this time appropriately indicated by Mr. A. L. Wells. Mr. H. H. Clayton gives an interesting summary of "The Meteorology of Total Solar Eclipses, including the Eclipse of 1905." Eclipse meteorology may almost be termed a meteorological curiosity, for total solar eclipses are infrequent, and their effects are not far-reaching, long-lived, or important. *Practically,* eclipse meteorology is therefore unimportant. *Theoretically,* however, there is much of interest in the subject. Mr. Clayton's paper gains much in general usefulness because of his bibliographic notes. His summary of results brings out the fall of temperature during total solar eclipses, with the notable fact that, in the free air and over the ocean, the time of minimum temperature occurs almost at the time of totality, while over the land surfaces the minimum temperature usually lags fifteen to twenty minutes after totality. A low vapor tension about the time of totality; a diminished wind velocity; an outflow of the "eclipse wind," and a maximum of pressure, all indicate a descent of air, are all phenomena connected with anticyclones. The author is firmly of the belief "that a cold-air cyclone is generated by the fall of temperature during an eclipse, and that the phenomena . . . are all results of this cyclone." The final paper in the first volume is one on "Eclipse Shadow-Bands," by Professor A. L. Rotch. In this the author gives the results which he has collected during many years, especially those obtained during the eclipse of August 30, 1905. "The inference from all the data collected is that the shadow-bands are produced by the diminishing crescent of light penetrating air strata differing in their thermal and hygrothermic conditions, and therefore in their refracting power."

2. More general scientific interest will probably attach to the second volume, which deals

with the results and methods of the pioneer work in *ballon sonde* meteorology, carried out by Professor Rotch in the United States with the financial cooperation of the Louisiana Purchase Exposition, and, later, of the Smithsonian Institution. Most men of science in this country probably already have a general idea of the importance of this investigation, and those who are able to keep up with meteorological literature know how widely this work has been discussed, and with what a warm welcome the results have been received abroad. If we mistake not, SCIENCE has contained several notices of this work. Mr. S. P. Fergusson contributes the first portion of the volume, on the "Apparatus and Methods," in which a brief account is given of the historical development of this kind of investigation. (It may be recalled that on March 21, 1893, MM. Hermite and Bésancon first employed a special instrument, recording time, pressure and temperature, which was sent up with a *ballon-sonde* in Europe.) "The Method of Reducing the Data" is discussed by Mr. H. H. Clayton. Then come a series of tables in which the records are given *in extenso*. "A Discussion of the Temperature and Wind," also by Mr. Clayton, follows. Particular interest attaches to the vertical temperature gradients, a subject which has been much discussed of late years, and which has important theoretical bearings. It appears that for all seasons the rate of decrease of temperature with increase of altitude above 2 km. increases up to about 8 km., then diminishes, and that there is an inversion in the gradient above 13–14 km., the well-known "isothermal stratum," whose existence was first established in Europe. Mr. Clayton contributes an interesting fact to the discussion concerning the cause of this isothermal layer. He suspects that a diminution in the northerly currents is characteristic of the region above 10 km., and that this may in part explain the phenomenon. The most frequent gradients in the lower air (0–1 km.) are the adiabatic gradients of dry air (0.9°–1.1° C.) and of saturated air (0.5°–0.6° C.). Inversions of temperature also show a maximum frequency in the lower stratum. Between 1,000 and 7,000 meters the prevailing gradients are the adiabatic gradients of saturated air. The adiabatic gradients for dry air diminish rapidly from the ground up to 2 km., and are rarely observed between 2 and 4 km. Above 4 km. they increase in frequency and reach a decided maximum between 8 and 9 km.; then decrease again in frequency to almost zero between 11 and 15 km. The upper parts of the two zones of maximum frequency of the adiabatic gradients of dry air are regions of maximum cloud frequency, the one zone being characterized by a prevalence of cumulus clouds, and the other by a prevalence of cirrus clouds. Cold waves, the author believes, are inclined strata of descending air, felt first at the earth's surface, and successively later at greater altitudes. The following statement is of special interest (pp. 81–82):

> At each successive rise of 2 km., the position of the area of cold in the anticyclone, and the position of the area of warmth in the cyclone, shifts northward in a semicircular course around the centers of the anticyclones and cyclones, until at 10 km. the area of cold is in the northern portion of the anticyclone, and the area of warmth is in the northeastern portion of the cyclone.

Our notice is already unduly long. We can but mention a final paper, by Mr. Clayton, on "The Distribution of the Meteorological Elements around Cyclones and Anticyclones up to 3 Kilometers at Blue Hill," an important contribution to a discussion to which our author has already devoted much time during recent years.

It is a pleasure to call the attention of the readers of SCIENCE to these valuable memoirs. Although the interest in meteorology is not as active or as widespread in this country as it should be, we feel sure that we are expressing the sentiments of a large number of our fellow-workers in science when we congratulate Professor Rotch, and his colleagues, most heartily, on their latest achievements in the field of meteorological research.

R. DEC. WARD

Bulletin of the American Museum of Natural History. Twenty-fourth Volume.

This large volume is only slightly less

formidable than its predecessor, and maintains the standard of excellence, the expression of *authority*, and the high typographical precision which has always distinguished this annual contribution to zoological literature. There are thirty-four separate articles—covering 647 pages, with thirty-three plates, one hundred and fifty-three text figures, which describe and illustrate two families, fifteen genera and subgenera, and two hundred and eleven species and subspecies "first described or renamed in this volume."

The initial impression made by an examination of the *Bulletin* is that of a voluminous contribution to systematology, in harmony with the first impulses that originated the work. Generalized articles are this year almost completely absent, and the rigorous, more technical requirements of science are only in a few places forgotten, as in some animated verbal excursions by Professor Wheeler, and the admirable historical review of the "North Atlantic Right Whale and its Near Allies," by Dr. Allen.

Mammalogy furnishes nine articles, ornithology two, entomology fourteen, vertebrate paleontology seven, invertebrate paleontology one, botany one. A serial notice of the articles as they succeed each other, with the most moderate epitomization of their contents, or, a reference to them by titles solely, will acquaint all interested with their nature and bearings.

In article I. Dr. J. A. Allen offers a "List of the Genera and Subgenera of North American Birds" according to article 30 of the International Code of Zoological Nomenclature. The subject is one identified with the author's name whose work in codification is historic. The work is confessedly intricate, and an inspection of the paper shows a master's hand. Dr. Allen remarks:

> Our present fabric of nomenclatural rules has been of slow growth. Without going into detail, it may be noted that prior to 1842 there was no official code of nomenclature; each author was his own arbiter, not only as to the sources from which names might be taken and to whom they should be accredited, but in respect to the sense in which they should be employed.

There seems to be an argumentative intention in the paper, and it might not inconsiderately be classed as a polemic on the topic of "*Elimination* Versus the *First Species* Rule." A short but very interesting paper by Professor Whitfield on "Carboniferous Fossils and Semifossils from the Arctic" follows. The most important conclusions are the eminent expression of an American Coal Measure fauna in the north, and the determination of a new inarticulate brachiopod, *Arctitreta*. Professor T. D. A. Cockerell contributes two articles on the insect fossil fauna and fossil flora of Florissant, Colorado. A copy of the rare Pennant's "Indian Zoology" has recently been exhumed in the library of the American Museum, and furnishes a topic for Dr. Allen in article V. He remarks of it, that:

> Like the copy in the British Museum, described by Newton, it lacks the original wrapper, and has no title page, and in all probability never had any, it being the first fasciculus of a work of which no more was published.

The plates are uncolored. Articles VI., VII., VIII., IX. and X. embrace characteristically elaborated descriptions of the ants of Porto Rico, the Virgin Islands (Culebra Vieques), of Jamaica, of Moorea, Society Islands, and of the Azores, the latter based on very insufficient and vestigial material.

Roy C. Andrews, a new author on the pages of the *Bulletin*, gives some new measurements of the North Atlantic right whale secured from the stranded Amagansett, L. I., specimen, which "exceeded in size the largest hitherto recorded." "A Four-horned Pelycosaurian from the Permian of Texas" is described in article XI. by Dr. Matthew, which is significantly called *Tetraceratops*, a new genus, whose "most noticeable feature is the presence of *two pairs* of prominent bony bosses or 'horns,' one rising from the premaxillaries, the other from the prefrontals."

This paper is succeeded by an important diagnosis of a new family of armored dinosaurs—the Ankylosauridæ—by Barnum Brown, the striking features of which are the "sculptured, plated skull; large flat or low-ridged body plates, some of which are united

as a shield; short spined vertebræ with parapophyses never rising above the centra; posterior ribs coossified to vertebræ."

In article XIII. Roy E. Andrews describes a new species of cetacean, *Mesoplodon bowdoini*. Article XIV. contains "Notes on Two Porpoises from the Pacific," by John Treadwell Nichols. "A Revision of the American Eocene Horses (*Hyracotheres*)," by Walter Granger is a very valuable study conducted along morphological lines with much care. In speaking of distribution the author says:

> The horizon of their greatest abundance is the Wasatch, especially the Wasatch of the Big Horn Basin, where they predominate over all other forms, with the possible exception of *Systemidon*, a very closely related genus.

He remarks that "One of the progressive characters of the Eocene Horses is the gradual *molarization* of the second, third and fourth premolars in both the upper and lower jaws," and the concluding section of his paper deals with "Premolar Development." This article precedes a paper by President Osborn on "New Fossil Mammals from the Fayûm Oligocene of Egypt," wherein some anomalous characters indicative of new family relations are recorded. The paper is preliminary, and reports that the expedition into the Fayûm region of northern Egypt in the winter of 1906–7 obtained a collection of about 550 specimens, "including more or less complete remains of most of the fossil forms so far known to be characteristic of this region."

A comprehensive paper, dealing with the history, the relationships and nomenclature, the geographical distribution and external and osteological characters of the "North Atlantic Right Whale and its near Allies," by Dr. Allen, arrests both eye and attention in the middle of this big *Bulletin*. The article possesses a notable strength, and seems to be a compressed result of laborious and extended previous study. It is excellent reading, and reveals the solid emphasis of authority. It comprises about fifty pages, with six contributory plates.

The ornithologist W. De Witt Miller reviews the beautiful manakins (genus *Chiroxiphia*) in article XIX. The genus "is a small group difficult to define by structural characters alone, on account of the great variations in external form among the several species, but well characterized by the coloration of the adult males, all of which have a blue black and a red or yellow crest." Mr. Miller has prepared a most instructive map of the geographic range of the genus which is new, and original for the birds discussed.

Embracing articles XX. and XXI., and covering 139 pages Professor W. M. Wheeler elucidates the taxonomy and the economy of the Honey Ants, and describes the ants of Texas, New Mexico and Arizona. It is difficult at this point to specialize. The subject is engrossing and the author brings to the discussion an extraordinary wealth of experience, observation and reading. Comment is naturally impossible except by myrmecologists, but the most inexpert eye can not fail to linger over many paragraphs descriptive of the positively amazing economies of these insects, especially such differentiated abnormalities as the "nepletes," individuals who become "living repositories for the surplus honey of the colony, which in time of need answers the purpose of the full honey-combs of the bee."

Article XXII. describes the Peary caribou, differing from its nearest allies *R. groenlandicus* and *R. arcticus* "in being much smaller, taking the skull as a basis of comparison, the females of *groenlandicus* and *arcticus* being as large as the *males* of *pearyi*." The paper is by Dr. Allen.

Dr. Allen also furnishes article XXIII., which discusses the rare *Solenodon paradoxus* Brandt from San Domingo. These notes are based upon specimens collected by A. Wyatt Verrill, and the collector's remarks "based on actual observation of the animal in life," are probably the most trustworthy description of its habits known.

Mr. Verrill says:

> In its habits the *Solenodon* resembles a hog, rooting in the earth and cultivated ground, tearing rotten logs and trees to pieces with its powerful front claws, and feeding on ants, grubs, insects, vegetables, reptiles and fruit, and at times

proving destructive to poultry. On several occasions it has been known to enter the houses in search of roaches and other vermin, and has been captured in rat-traps.

It is strictly nocturnal, and spends the day in caves, holes in the coral limestone rocks and in hollow trees and logs. It is a slow, stupid creature. It is unable to run rapidly, but shambles along with the zigzag, sidewise motions of a plantigrade. It is, doubtless, owing to this that it obtained the native name of "Orso" (bear).

Article XXIV. by S. A. Rohwer is on "A Fossil Larrid Wasp"; the same author contributes article XXV., a discussion of the fossil saw-flies (Tenthredinoidea) of the Florissant Shales. Article XXVI. comprises notes on the skull of *Lysorophus tricarinatus* Cope, by E. C. Case, of which the author remarks, that

Were it not for the extreme specialization of this limbless Gymniophiona-like form it would *occupy almost exactly the transitional position between the amphibians and reptiles.*

Article XXVII., by Dr. Matthew, particularly describes the osteology of *Blastomeryx,* and discusses the phylogeny of the American Cervidæ, in which the writer asserts that

Blastomeryx proves to be a very primitive deer, approximately ancestral to the American Cervidæ, and derivable in its turn from the Oligocene genus *Leptomeryx*, whose relationship to the Cervid phylum had not been suspected. We are thus enabled to trace the ancestry of the American Cervidæ back to the Oligocene, by successive stages known from the entire skeleton, and not merely from the inadequate evidence of teeth and jaws.

Article XXVIII. is by Filippo Silvestri, on the Myriopoda from Porto Rico and Culebra; article XXIX. consists of "Mammalogical Notes," by Dr. Allen; article XXX. is a further contribution by S. A. Rohwer on the saw-flies from Florissant, Colorado.

President Osborn contributes article XXXII. on "New or Little Known Titanotheres from the Eocene and Oligocene." Professor Wheeler discusses the "Ants of Casco Bay, Maine," in a very attractive paper, filled with descriptions of predatory expeditions, slave-making hunts and colonial devices and aspirations, which are picturesque enough in themselves, and are treated with very circumstantial seriousness. Professor Wheeler in this paper engages again in an extended debate on the origin of slavery (*dulosis*), and social parasitism in ants, wherein we are told that Wasmann has repeated Professor Wheeler's experiments on the formation of colonies, has corroborated them, and that "an outstanding difference in interpretation" only now remains between these distinguished naturalists.

The volume concludes with a paper by Dr. Allen, on "Mammals from Nicaragua."

L. P. GRATACAP

SPECIAL ARTICLES

RADIUM IN SPIRAL NEBULÆ AND IN STAR CLUSTERS

IN consequence of a prolonged study of the relation to celestial spectra of the spectrum of radium emanation as published by Sir William Ramsay and Professor J. Norman Collie,[1] I announced on January 19, 1905, the principle of "critical radioactivity" or the transformation of the chemical elements at critical pressures and temperatures in the stars. This explosive transformation of the elements at critical physical states, occurring in the heavenly bodies, I have named "radioaction," in order to distinguish it from ordinary radioactivity.

Radioaction, hypothesis *a*, was announced as a tested theory in the face of Rutherford's statement:

The transformation of matter occurring in the radio-elements is, on the other hand, spontaneous, and independent of temperature over the range examined.[2]

It was also in challenge of the natural inference to be drawn from the statement of Runge and Precht, made at the close of their account of the measurement of the lines of the radium spectrum:

Concerning all strong radium lines, it may be affirmed with certainty that, according to our measurements, they are not found among the measured solar lines of Rowland.[3]

Changes in pressure and temperature are, on all sides, said to produce no marked changes

[1] *Proc. Roy. Soc.*, 73, p. 470, May, 1904.

[2] "Radioactivity," first edition, p. 350.

[3] *Ann. der Phys.*, 317, 412, June, 1903.

in radioactivity, and, moreover, the precise measuremental matching of the lines of the radio-elements with celestial lines is universally held to be essential to their identification in the heavenly bodies. In direct violation of these views, radioaction, hypothesis α, was proposed and confirmed. A second principle, hypothesis β, which need not now be described, was also used from the first, and thence a set of principles of interpretation of celestial phenomena, deduced and verified, which, for brevity, I designate the theory of radioaction.

The theory was originally verified with difficulty by constantly summoning the calculus of probabilities to its aid, and kept from publication on account of obstacles encountered in presenting the vast mass of evidence.

Radioaction, or critical radioactivity, I have used the last five years, as a principle explanatory of many strange and hitherto inexplicable phenomena, of inorganic evolution. I have found radioaction to be an essential factor in cosmic evolution. By means of it I have been able to predict the necessary character of many phenomena peculiar to the morphology, photometry, spectroscopy and electro-optics of nebulæ, stars, sun and comets. Excepting two papers on this subject, read before the American Philosophical Society, one, "Universal Celestial Radioactivity," January 20, 1905, and the other, "Radioactivity in Solar Phenomena," April 14, 1905, both as yet unprinted, I have contented myself, of necessity, with the accumulation of proofs of the theory, until its presentation to the public in the form desired should be feasible.

Lately, however, the data for direct confirmation of this theory have come so freely to hand that I have decided to lay aside, in part, the ideal of aiming to present, as a unit, my theory of radioaction, with all its wide ramifications and interesting consequences.

Recently Mr. A. T. Cameron and Sir William Ramsay have remeasured the spectrum of radium emanation, and Professor E. Rutherford and Mr. T. Royds have also brought to bear all the refinements of physical accuracy upon the same problem; so that now there is available a body of information of the highest value concerning this spectrum.

Reflecting upon the use of this material, my theory suggested an investigation which resulted in a very simple and decisive confirmation of radioaction. This first and peculiar confirmation, due to the later determinations of the spectrum of radium emanation, I reserve for appropriate publication.

It was on April 26 of this year that I received Lick Observatory Bulletin, No. 149, recording the work of Dr. E. A. Fath on the "Spectra of Some Spiral Nebulæ and Globular Star Clusters." This bulletin permitted me, at once, to establish the fact that the absorption spectrum of radium emanation was present in this great nebula of Andromeda, and in other spiral nebulæ, and likewise present in the star cluster of Hercules (probably along with one line of radium), and in two other star clusters. It also came out clearly that the radium series of elements was not disclosed by the spectrum of the Spiral Nebula N. G. C. 1068. Finally, on referring to the observations of *bright* lines in the nebula of Andromeda by Sir William Huggins and Lady Huggins, I was gratified, but not surprised, to find that these lines were plainly identifiable as lines of radium emanation.

It has seemed proper to attempt here only a brief examination of the facts, since the present conditions prohibit a completely tabulated and detailed discussion. First, I must say that it is with no little satisfaction that I find myself reviewing this piece of superb work issued under the direction of Professor Campbell. For, in my study of radioaction, during these five trying years, I have again and again noted Professor Campbell's accurate and painstaking description of unusual celestial phenomena, his balanced review of the work of others (including the celebrated thrust concerning the Purkinje phenomenon), and his remarkable insight into the value of anomalous observations, and of mooted suggestions for their explanation.

The telescope used by Dr. Fath in the work was the celebrated Crossley reflector, with a specially designed spectrograph attached. The difficulties mastered were of the first order.

The total exposures ranged, in the case of the Andromeda nebula, up to $18^h\ 11^m$, accumulated during three different nights, yielding fourteen lines; and in that of N. G. C. 7331 up to $22^h\ 22^m$, accumulated during seven nights and yielding two lines. Of the accuracy of the wave-length determinations Dr. Fath says:

> When measuring known spectra the wave-lengths of the lines usually come within 5 or 6 Angström units of the correct value, although occasionally a larger deviation is found. Thus the third figure given may usually be considered correct.

In the identification of the lines, it is possible that Dr. Fath was unconsciously influenced by Scheiner's emphatic assertion:[4]

> It is thus proven that the Andromeda Nebula exhibits a spectrum of the class IIa, or further, that the greater part of the stars composing the nucleus of this nebula belong to the second spectral class.

The inference that "the spectrum is of the solar type" will, I think, be found to be too hasty. The absence from Dr. Fath's plates of any indication of the bright lines of Huggins was, indeed, quite misleading. Bright lines will, undoubtedly, be photographed, later, in the great nebulæ of Andromeda.

The following table records in the first and second columns the wave-lengths and intensities of the lines in the Andromeda nebula as measured by Dr. Fath, in the third and fourth columns the identifications with the spectrum of radium emanation suggested by myself, and in the last column, the identifications proposed by Dr. Fath.

TABLE I

No.	N. G. C. 244		Ra. E.		Identification by Dr. Fath.
	λ	In.	λ	In.	
(1)	3740	1/2	3739.9	7/1	Solar group, center λ 3735
(2)	3826	1/2	3818.0	2	Solar group, center λ 3830
(3)	3870	1/2	3867 6	4	Solar group, center λ 3872
(4)	3934	10	3933.3	3	Calcium K
(5)	3969	10	3971.9	9	He and Calcium H
(6)	4060	2	4055.7	1	Mean of Solar { λ 4046 Fe, λ 4064 Fe, λ 4072 Fe }
(7)	4156	2	4166.6	20/1	Solar group, center λ 4150
(8)	4203	1	4203.7	10	H δ
(9)	4230	1	4225 8	2	Ca, λ 4227
(10)	4303	5	4308.3	10	Solar G
(11)	4385	2	4384.0	3	Fe, λ 4384
(12)	4456	1	4460.0	10	Solar group, center λ 4457
(13)	4676	1	4681.1	10	Solar group, center λ 4668
(14)	4855	3	H β		H β

The wave-lengths of the lines of the radium emanation are taken from the table of Rutherford and Royds.[5] The second number in the intensity column of radium emanation records, for line No. (1), the value by "photograph 3," and for line No. (7) the "visual" estimate. It should be borne in mind that for the nebular lines "the third figure given may usually be considered correct." Both schemes of identification are suggested by theory. Dr. Fath's is supported by the theory that the Andromeda nebula is a cluster of solar stars. No conclusive review has been given of such theory. From his own use of Bohlin's parallax of this nebula, he infers that "the 'star cluster' theory is not very satisfactory." He, however, necessarily recurs to solar lines and "groups of lines," selected, chiefly, on the basis of mere matching.

My own identification assumes the theory that all nebulæ whatsoever are electrically luminescent results of radioaction in the associated "stars." This theory has repeatedly been found to be confirmed in accounting for analogous phenomena. It explains why, now bright lines, now dark lines are observed in this nebula. It suggests the kind of chemical elements whose traits are here to be found. It accounts for the variability of this nebula in 1885, by asserting that the "star," variable through radioaction, holds the secret of cosmic evolution. Finally, it banishes the necessity for imagining a lawless collision of a pair of stars for generating spiral nebulæ.

The general agreement in wave-length of this single radio-element with all but one of the nebular lines must be given weight. There are three lines, Nos. (8), (9) and (10), which, both in the spectrum of the nebula and in that of the emanation, follow consecutively. Moreover, their intensities, all conditions considered, are quite consistent with the hypothesis of identity. There is no necessity for reminding spectroscopists that, on account of the wide variation of intensity with changes in excitation, fair agreements in such a case

[4] *Astrophys. Jour.*, 9, 150.

[5] *Phil. Mag.*, Ser. VI., Vol. 16, p. 317, Aug., 1908.

count toward the probability of identity, while disagreements do not count against it. I also call attention to the practical agreement in wave-length and in grade of intensity of lines Nos. (4) and (5). A detailed discussion of the probability of identification of each line seems unnecessary here. Admitting the uncertainty in the measurements of the nebular lines, considerable weight can fairly be given to general agreement. I have nothing to say to the spectroscopist who insists on the absolute matching of lines in wave-length as the final test of "identification" of all celestial spectra.

If radioactive outbursts determine both the bright lines and the dark lines, and account for the appearance and disappearance of the former, the celebrated bright lines of Huggins may supply a test of the theory. In the following table, the first column contains the estimated wave-lengths of *bright* lines observed in the nebula of Andromeda by Sir William Huggins and Lady Huggins,[6] the second and third, the corresponding radium emanation lines and their intensities observed by Ramsay, Collie and Cameron, and the fourth and fifth, those observed by Rutherford and Royds.

TABLE II

No.	N. G. C. 224	Ra. E.		Ra. E.	
	λ	λ	In.	λ	In.
(1)	580	580	(persistent)	583	1
(2)	543	543	faint	539.5	0
(3)	538	537	2	537	0
(4)	511 (a group of 4 or 5 lines)	508	2	512	2
				509	10
(5)	495 (a group)	498	2	496	1
		494	2	495	1
		492	3	492	1
(6)	476	477	2	477	1
(7)	455 (suspected)	458	3	458	1
		455	2	455	0
		452	1	451	1

For the sake of simplicity of statement, and so as to conform to the grade of accuracy of the estimates by the astronomical observers, only the first three figures of the wave-length measurements of the physicists are given. The general agreement is very satisfactory.

[6] "An Atlas of Representative Stellar Spectra," p. 125.

Line (4) is "a group of 4 or 5 lines," and becomes so, first, because both lines concerned are relatively intense, and secondly, because, as astrophysicists well know, an intense line is at times likely to break up into a group. Line (5) is evidently "suspected" because of decreased sensitiveness of the eye for this region, and because of the low intensity of the three lines concerned.

A more detailed discussion would, I am sure, place this identification beyond any possibility of doubt, but also carry me farther into the subject than I had planned. It is worth while remembering, however, that admitting radioaction as receiving confirmation in other celestial bodies, it may here, with some weight, predict, as it does, the fact of bright lines, their variability, and their character as radioactive products. The two groups (4) and (5), examined on the basis of the strictest principles of electro-optics would alone prove identity, and their testimony is certainly not weakened by the other lines. The difficulties conquered by the famous chemist, and the masterful physicists in furnishing the measured lines of the rare radium emanation are certainly always most gratefully to be acknowledged; and the refined and conscientious work of Sir William Huggins and Lady Huggins in independently examining these evanescent bright lines of the nebula of Andromeda through the weary nights of many successive years, is, I hold, not only emphatically verified by this identification, but their faith in its high and lasting value adequately commended by the result.

The spectra of five other spiral nebulæ were likewise photographed by Dr. Fath at the Lick Observatory, and four of these, consisting each of but from one to three lines, disclosed, in each, identity with radium emanation in one to two lines. The spiral Nebula N. G. C. 1068 discloses, as stated, no known radio-element of the radium series, unless the bright λ 3733 and λ 3878 be helium lines. It is, however, practically certain that the celebrated main nebular lines characterizing the spectrum of this object, and of others like it, are due to radio-elements yet to be identified.

The spectra of star clusters next claim at-

tention. The spectrum of the Hercules cluster N. G. C. 6205, obtained by Dr. Fath is quite remarkable. He says:

> It is composed of a number of parallel strips of different intensities, containing a few faint absorption lines. Each strip is probably the spectrum of a single star, or group of stars. No two strips contain the same set of lines. Four of the strips were strong enough to be measured.

In the following table the first column states the number of the strip, the second the wave-length, the third the intensity, the fourth the corresponding wave-length of radium emanation, the fifth its intensity.

TABLE III

Strip.	N. G. C. 6205		Ra. E.	
	λ	In.	λ	In.
(2)	3935	3	3933.3	3
(1)	3966	3	3971.9	9
(2)	3970	3		
(4)	4118	2	4114.9	7
(1)	4294	1	4308.4	2
(4)	4302	1		
(3)	4340	1	4340.8	50 Ra.
(4)	4463	1	4460.0	10
(2)	4790	1	4796.7	1

It will be noticed that to the single line of strip (3), I have assigned the radium line of high intensity, although an emanation line λ 4340.9, intensity 7, also exists. I think the evidence for the existence of radium emanation in this cluster is sufficient to make discussion unnecessary. It will be seen that for the different strips the lines vary. Difference of excitation, due to the difference of physical state of each star, completely accounts for the variation. In the globular clusters N. G. C. 7078 and 7089, the hydrogen lines are, as Dr. Fath indicates, probably evident from Hβ to Hθ. Radium emanation must, however, also claim λ 4102.2, λ 3971.9 and λ 3933.3 in each of these star clusters.

It may not be amiss to venture a few suggestions:

1. Each photograph or observed spectrum of a nebula, star cluster, or bright line star, should be treated as a separate entity in publication; otherwise the successive changes in given lines are averaged out of existence.

2. If possible, the spectrum of the nebula of Andromeda should be repeatedly photographed.

3. It should be the aim to photograph as soon and as effectually as possible the spectra of the short-period variables in globular star clusters even if at first integrated results, both as to stars and as to periods, are obtained.

In conclusion, I must state that I am quite conscious of the incompleteness of this discussion. Indeed, it is the manifest complexity of the subject that has made me, hitherto, recoil from a preliminary application of the theory for publication. Radium has been known for at least ten years as a terrestrial element, its spectrum has been repeatedly determined and compared with the spectra of the heavenly bodies, and yet up to the present moment there has been published, so far as I know, no demonstrative evidence concerning its existence in the heavens. On the contrary, careful comparisons made by chemists, physicists and astronomers, have apparently shown that the spectra of radium and radium emanation, the element into which radium is at once transformed, are not identifiable with stellar spectra. It is, therefore, significant that the identifications here made were suggested by the theory of radioaction.

MONROE B. SNYDER
PHILADELPHIA OBSERVATORY,
May 3, 1909

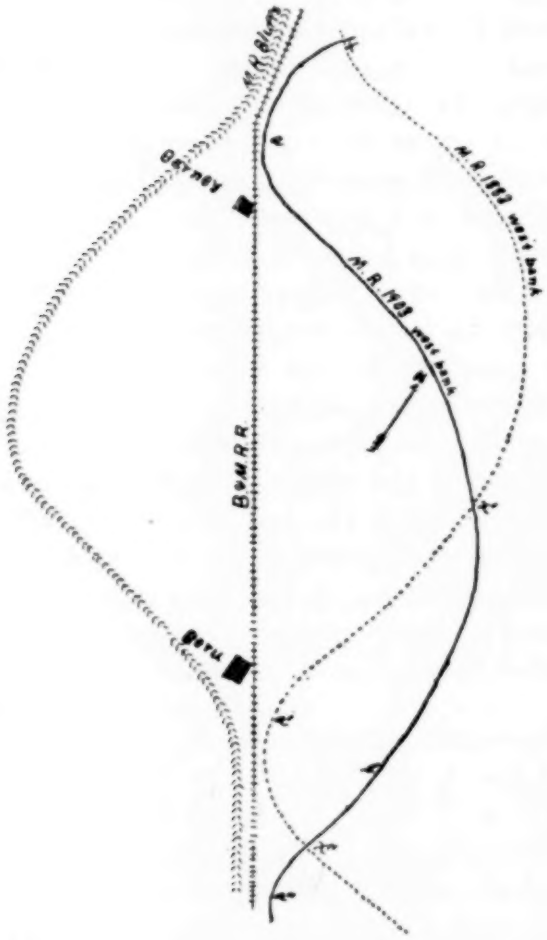
OBSERVATIONS ON THE SHIFTING OF THE CHANNEL OF THE MISSOURI RIVER SINCE 1883[1]

THE radical changes which annually take place in regard to the position of the Missouri River channel and the great loss of property occasioned by the same have presented a problem worthy our careful consideration. In addition to the scores of farms which are washed out annually the railroads suffer greatly by having their roadbeds destroyed. Hence, this becomes an economic problem of vast proportions.

In the following chart we have represented a portion of the river valley near the village of Peru, including ten or twelve miles of the river bed. The upper dotted line represents

[1] Read before the Nebraska Academy of Sciences.

the position of the western bank of the river in 1883 and the continuous line represents the position of the western bank in 1903. Locating the letters X, X' and X'' at the intersections of the old and new channels; then, all the territory between the old channel and the new and between X and X' has been washed from the Nebraska side, while the corresponding territory between X' and X'' has been



added to the Nebraska side. From the point a' to the point b is 5,000 feet, all of which has accumulated in twenty years, or an annual increase of 250 feet. The actual increase has varied, however, from 50 to 500 feet annually. At no time during the twenty years has the channel between X' and X''' encroached upon the Nebraska shore. On the other hand, the river has annually encroached upon the Nebraska shore between the points X and X' for the same period of time.

The river, at Peru, has a descent of about eleven inches per mile and the rate of flow varies greatly. During high waters, in the spring months when the principal washings take place, it is found that at the points a and a'' the water along the western shore has an elevation of 20 to 50 inches above that of the eastern shore, directly opposite. This piling up of the water along the western shore causes a part of the water to turn up stream, producing immense eddies at times a mile or more in circumference. The principal part of the water, however, is directed down the stream diagonally toward the opposite shore where the water is at a much lower level.

The most rapid erosion usually takes place in early spring at the time the ice breaks in the river; frequently, however, the June freshets play great havoc with the banks. The rate of erosion at the upper half of the curve is not the same as the deposition at the lower end of the same curve. For example, in twenty-four hours there may be from ten to twenty-five acres washed from the shore aX', while the accretion to the shore line $X'a''$ is very gradual. As the channel encroaches upon the upper portion of the curve it shifts farther from the lower portion. As the main channel recedes from the shore the space is usually transformed into eddies which supply the necessary conditions for depositing large quantities of detritus. In the shifting of the channel the symmetry of the curve is usually quite well preserved with reference to upper and lower halves.

Another factor enters our problem: the general direction of the river is southward and it is gradually flowing over larger and larger circles of the earth. Hence, the water piled up at a starts off in the direction of X' with the impetus given it from the piling up of the water. This rebounding force is counteracted by the influence of the rotary action of the earth by the time the water reaches X'; so, beyond the point X' the rotary action of the earth becomes the dominant factor and the water gradually falls behind until it again cuts the western bluffs at a''. Furthermore, the height to which the water is elevated at a determines, in a large measure, the distance aX' while the distance $X'a''$ determines the height to which the water is piled up at a''.

Hence, by locating the points *a*, *a'* and *a''* one can determine, with almost mathematical precision, the land next in order to be removed and the location of the new deposit. Again, sooner or later points *a* and *a'* will coincide and lines *aX'* and *a'X''* will coincide.

The dotted line *yy'* represents the manner of washing since this article was first prepared. The railroad and station at Barney have been washed out and a new station has been located farther to the southwest as indicated on the chart.

We have taken simply one section of the river as an illustration; but, after studying in detail a large number of these curves and after studying in a general way the entire river bed from Sioux City to the southern border of Nebraska we believe no exception to the chart can be found. In applying these principles to the washings of the eastern bank of the river all positions would be reversed.

The effort to hold the channel of the river under the bridges at Omaha and Nebraska City has greatly influenced the recession of the series of curves below each bridge.

We may, therefore, summarize the following points:

1. That the Missouri River channel is methodical in its shiftings.

2. The location of the new channel and the new deposit may be determined beforehand with mathematical precision.

3. There is a recession of the series of curves down stream.

4. The channel cuts the western bluffs at more or less regular intervals.

5. At no point does the river encroach upon the eastern bluffs.

H. B. DUNCANSON
NEBRASKA STATE NORMAL SCHOOL,
PERU, NEBR.

THE PROPER NAME OF THE AMERICAN EEL ANGUILLA ROSTRATA (LE SUEUR)

THROUGH an error in recording the date of publication the common American eel has been given a later-bestowed technical name and the author of a prior name and description has been denied the honor of first naming the American species.

In the *Journal of the Academy of Natural Sciences*, Philadelphia, No. 5, Vol. I., p. 81, C. A. Le Sueur described the common American eel under five specific names, viz.: *rostrata, Bostoniensis, serpentina, argentea* and *macrocephala*, all of which he erroneously placed under the genus *Muræna* of La Cepede.

Several months later C. S. Rafinesque, in *The American Monthly Magazine and Critical Review*, No. II., Vol. II., p. 120, described this eel under the name *Anguilla chrisypa* and *A. blephura*, and his note after the descriptions, "These two species of eels appear different from all the new species lately described by Mr. Lesueur, under the old name of *Muræna*, which belongs properly to a very different genus without pectoral fins," led me to look into the matter of the proper name for the American eel.

Rafinesque's name *chrisypa* has of late years been applied to this eel, authors citing 1821 as the date of publication of the journal in which Le Sueur's descriptions occur notwithstanding the fact that the numbers are plainly marked, No. 1, May, No. 2, June, No. 3, July, No. 4, August, and No. 5, September, 1817. From the dates and other marks on these numbers it was evident that they were promptly printed, but having been informed that the journal had not been printed and published, as dated, I addressed a note to Mr. Witmer Stone, of the Philadelphia Academy of Natural Sciences, and quote his courteous and satisfactory reply, written March 17, 1909.

My dear Mr. Bean: Such data as I have accumulated on dates of issue of our publications relate to our Proceedings only & I had little hope of solving the problem contained in your letter. Fortunately I asked Mr. Wm. J. Fox our Asst. Librarian if he knew of any clew and he suggested looking in a bound volume of manuscript letters from Thos. Say to Rev. J. F. Melsheimer, from which he had published extracts some years ago in Entomological News, as he thought there was some allusion to sending parts of the Journal to Melsheimer. Curiously enough the first mention of the matter that we found was as follows, in letter dated November 6, 1817, "yesterday I sent you the *Fifth* part of the Academy's Journal and tomorrow I will send you the *sixth*."

The fact that the sixth part was out or was daily expected would go far to prove that the fifth part had been out about a month. Any way we *know* that it was issued by Nov 6, 1817, and are pretty safe in saying that October was the month of issue, no doubt the first week.

I am glad to have been able to settle this matter for you, but the credit is due to Mr. Fox not to me. Sincerely yours,

WITMER STONE

The proper technical name for the common eel of eastern North America is *Anguilla rostrata* (Le Sueur), described from specimens taken in Lakes Cayuga and Geneva, New York.

B. A. BEAN

U. S. NATIONAL MUSEUM,
WASHINGTON, D. C.,
March 20, 1909

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
SECTION L—EDUCATION

THE Baltimore meeting of Section L showed that this new section is growing in strength and usefulness. The section's policy of devoting each session to a single topic with set papers by invited speakers was tried and proved a great success. The section plans to devote itself to a scientific study of educational problems, and has appointed a committee to study the distribution of students in elective courses in college and report at the next meeting. This committee consists of Professor E. L. Thorndike, chairman, and Messrs. J. G. Bowman, George E. Fellows, Abraham Flexner, C. H. Judd, Frederick Keppel and C. R. Mann.

Officers for the coming year were elected as follows:

Vice-president—Dean James E. Russell, Columbia University, New York.

Member of the Council—President Charles S. Howe, Case School of Applied Science, Cleveland.

Member of the General Committee—Professor Charles H. Judd, Yale University, New Haven.

Member of the Sectional Committee—Hon. Elmer E. Brown, United States Commissioner of Education, Washington.

Vice-president John Dewey presided at all the meetings. The address of the retiring vice-president, Hon. Elmer E. Brown, dealt with great insight with the subject "World Standards of Education." This paper will be printed in SCIENCE.

The first session of the section was devoted to a discussion of the United States Bureau of Education by Mr. W. Dawson Johnson, librarian of the bureau; Professor C. E. Elliott, of the State University of Wisconsin, and Mr. E. C. Moore, superintendent of schools, Los Angeles, Cal.

Mr. Johnson showed that the Bureau of Education is, on the one hand, the representative of the nation among the nations of the world; and, on the other hand, the representative of the common interests of the several states of the United States. As the representative of the United States in international intercourse its duty is, first, to study foreign educational experience with a view to selecting that which best fits American needs, and, second, to communicate to foreign countries official information regarding our own educational experience. This international intercourse may take the form of expositions, or congresses, or tours of investigation; it may require the direction of exchanges of professors and teachers between the United States and foreign countries, and of interchanges of students. With the development of international relations the work of the bureau as an office of international communication will become increasingly important, and as American conditions approximate those in European countries its service as a bureau of information regarding European educational experience will become more and more necessary. The duties of the bureau to the state departments are twofold: first, to relieve them of the duty of carrying on scientific investigations which may be carried on more economically or more efficiently by a central bureau; second, to carry on such other investigations as may facilitate and improve the administrative source of the state offices. The need of such work has been recognized in several states by the creation of special educational commissions. It has been recognized by the leading educational institutions and societies also. The growing recognition of the importance of such investigations and the advantages which a central bureau has for carrying them on must lead inevitably to the strengthening of the federal office. At present the bureau is being reorganized with a view to more adequate performance of its duties. The work of reorganization has begun in the library of the bureau. Little progress can, however, be made without larger appropriations by Congress, especially such appropriations as may enable the office to be of greater service to state school officers, educational commissions and legislative committees.

Professor Elliott pointed out that, notwithstanding the evident phenomenal advance which

all grades of education have made during recent years, there continues to exist such a spirit of general unrest and criticism of results as to preclude any feeling of satisfaction or security to serious students and workers in education. In the controversy between the educational progressives and the educational conservatives, society in general has assumed a defensible position and has accepted the program for progress as rapidly as the scientific soundness of that program was demonstrated. Our educational science in the past has been decidedly individualistic and the scientific problems of education have not been analyzed and delimited so as to permit the practical utilization of the collected results of accomplished investigation or the cooperative efforts of individual investigators. The real obstacle to progress has been the lack of coordinated and cooperative research. There is need to-day for scientific insight rather than emotional propagandism. Governmentally the center of gravity is shifting from the *state* to the *nation*. The traditional balance between state and federal activities has been overthrown and the signs of the times indicate the development of many new social functions, the full and adequate performance of which will depend upon the national government. Education, especially in its elementary and secondary stages, is the one subject of vital significance to human welfare, the scientific investigation of which the national government has not generously subsidized and encouraged. The expansion of United States Bureau of Education so as to enable it to serve as the central laboratory for American research in education, undertaking that now not undertaken, coordinating and organizing that now being attempted in a haphazard and incidental manner by individual institutions and societies, and causing it thereby to assume the leadership now so much needed for the real advance of American education seems to offer the greatest opportunity for the new federalism.

Mr. Moore's paper will be printed in full in SCIENCE.

At the second session of the section the topic "American College Education and Life" was treated by Professors Josiah Royce, of Harvard; Wm. North Rice, of Wesleyan; James H. Tufts, of Chicago, and Mr. Abraham Flexner, of the Carnegie Foundation for the Advancement of Teaching. These papers have been printed in full in SCIENCE for March 12 and 19 .

Two joint sessions were held: one with the American Psychological Association and the other with the American Federation of Teachers of the Mathematical and the Natural Sciences. At the first of these joint sessions the following program was given:

"Psychological Investigations that will help the Educator," by Professor E. A. Kirkpatrick.

"Studies in Number Consciousness," by Professor C. H. Judd.

"The Factors of General Ability," by Professor E. L. Thorndike.

"Homogeneous Content in the Measurement of Memory," by Professor C. E. Seashore.

"The General Effects of Special Practise in Memory," by Professor W. F. Dearborn.

"The Study and Treatment of Retardation," by Professor Lightner Witmer.

The report of this meeting has been published in the Proceedings of the American Psychological Association.

The other joint session with the science teachers was given up to a symposium on "The Problems of Science Teaching" by President Ira Remsen, Jonns Hopkins University, and Messrs. Wm. T. Campbell, Boston Latin School; George F. Stradling, Northeast Manual Training High School, Philadelphia; John M. Coulter, The University of Chicago, and Lyman C. Newell, Boston University. The report of this meeting has been published in SCIENCE for April 30, in connection with the report of the American Federation, and also in *School Science and Mathematics* for March and April, 1909.

C. R. MANN,
Secretary

THE ENTOMOLOGICAL SOCIETY OF AMERICA

THE fourth meeting of the Entomological Society of America was held in Baltimore, December 30 and 31, 1908, in affiliation with the American Association for the Advancement of Science.

The meeting was called to order by the president, Dr. W. M. Wheeler, in the Eastern High School, at 11 A.M., December 31. Dr. Fernald read the report of the committee on nomenclature. Moved and carried that this report be received and printed and discussed one year later, and that this should be the general policy in dealing with these reports. This report is appended. The managing editor made an informal report upon the condition of the *Annals*. The president announced the death during the year of Dr. W. H. Ashmead, an honorary fellow; Dr. James Fletcher,

a fellow, and of three members, C. Abbott Davis, Albert V. Taylor and Alexander Craw. The president announced that he had appointed committees to draw up suitable resolutions upon the death of Drs. Ashmead and Fletcher. These resolutions are appended. The secretary read a communication from W. C. Wood suggesting action looking toward abolishing the tariff on insects. Moved and carried, "That it is the sense of this society that the duty on insects is objectionable and should be abolished." The matter was referred to the executive committee with power. Adjournment until 1:00 P.M.

At that time the meeting was called to order by the first vice-president, Dr. J. B. Smith. The report of the nominating committee was read, and in accordance therewith, the secretary was instructed to cast a ballot for the following officers, which was done:

President—Dr. Henry Skinner.

First Vice-president—Professor Herbert Osborn.

Second Vice-president—Dr. A. D. Hopkins.

Secretary-Treasurer—J. Chester Bradley.

Additional Members of the Executive Committee—Professor J. H. Comstock, Dr. W. M. Wheeler, Mr. E. A. Schwarz, Dr. John B. Smith, Rev. Professor C. J. S. Bethune, Professor Lawrence Bruner.

Member of Committee on Nomenclature to Serve Three Years—Dr. E. P. Felt, to succeed himself.

There being no further business, papers were read as follows:

Notes on a Lecanio-diaspid: W. C. O'Kane.

A. N. Caudell spoke briefly on a method that he had adopted for preserving types. He uses Riker mounts for this purpose.

Contributions to our Knowledge of the Host Relations of Ticks: W. A. Hooker.

Discussion by Messrs. Skinner, Cooley, Viereck, Bruner and Miss Mitchell.

At 3 P.M. a joint session with Section F of the American Association for the Advancement of Science was held in the Eastern High School. Dr. J. B. Smith presided over the meeting. The following papers were read:

Investigations of Toxoptera graminum and its Parasites: Mr. F. M. Webster.

This paper was published in Science, February 12, 1909, p. 278.

Discussion by Professor Washburn and Mr. Hayhurst.

On the Muscular System of Spiders' Legs: A. Petrunkevitch.

A Note on the Habits of the Wall-bee, Chalicodoma muraria: J. N. Comstock.

This insect is very abundant at Dendera, Egypt, where it is covering the walls of the ancient temple, that have been unearthed, with its cement-like nests, rendering it impossible to read the inscriptions upon them.

Evolution and Adaptation in the Palpi of Male Spiders: J. A. Nelson.

To be published in full in the *Annals*. Discussion by Drs. Hopkins and Petrunkevitch.

Species, Varieties, Races, etc.: J. B. Smith.

Discussion was postponed until after the reading of the next paper.

What is a Species? H. Skinner.

Considerable discussion was evoked by these two papers, Messrs. Williston, Fernald, Felt, Viereck, Schwarz, Caudell and others participating.

Adjournment.

At 10 A.M. on December 31, the meeting was called to order by Dr. Wheeler, and the following papers read:

Death-feigning by Zaitha fluminea: H. P. Severin. Read by Professor Osborn.

Some Habits of Seed-infesting Chalcis Flies: C. R. Crosby.

The Development of the Scent-pockets of Anosia: W. A. Riley.

The pupal development of the scent-pocket or, as it is proposed to designate it, the murotheca, of the male Monarch butterfly was discussed. Its future position is indicated in the earliest pupa by the richness of the supply of tracheoles, indicative of the greater physiological activity in this region. Before pigmentation is apparent in the rest of the wing the murotheca stands out as a densely pigmented black disk overlapping vein Cu_2. Sections show that the androconia originate on the free surface of the upper wing membrane, which pushes out over the vein and later in pupal life folds on itself, giving rise to the pocket-like murotheca with its opening directed caudad. The structure of the androconal glands was briefly discussed.

The Tracheal Supply in the Central Nervous System of the Larva of Corydalis: William A. Hilton, Cornell University.

There are three pairs of tracheal branches going to the brain and two to the subesophageal ganglion. The first thoracic has one pair and a median tracheal branch. All the other ganglia have one pair except the last or eighth abdominal,

which has, in addition to the branches similar to the others of the other ganglia, large branches from the system of the seventh ganglion. The connectives between the ganglia with the exception of those between the subesophageal and first thoracic and those between the seventh and eighth, get all of their branches from the ganglia above and below them. In the case of the first exception, there are two additional branches from the outside. In the case of the second, all of the connective supply comes from the system of the seventh ganglion. There is in each ganglion a very complete superficial and deep network of large and small branches. The tracheoles in the center of the ganglia are *very* numerous and very intricately woven together, but in no place was anastomosis found.

Observations on the Taxonomy of the Cecidomyiidæ: E. P. FELT.

Recording and Mapping the Entomological Fauna of a State: FRANKLIN SHERMAN, Jr., State Department of Agriculture, Raleigh, N. C.

The 5 × 8 card is used as the unit, one side being rather closely ruled, while on the other side is printed an outline map of the state. Each insect is given a card—the divisions into orders, families and genera being indicated by appropriate guide-cards. All records as to place and date of capture are written in condensed form on the ruled side, while on the map a dot is placed for each locality. Gradually these records will define the different life-zones of the state and will indicate the approximate distribution of each species.

Rediscovery of the Bibionid Genus Eupeitenus: D. W. COQUILLETT.

In 1834 Macquart described *Penthetria atra* n. sp. from a male specimen in Serville's collection, captured at Philadelphia, Pa., since which time the species has not been taken again until April 26, 1908, on which date Mr. H. S. Harbeck collected a female specimen at Germantown, a suburb of Philadelphia. Walker, in 1838, referred two British American specimens to this species, but there is no certainty that his identification was correct. Macquart's figure is very faulty. In 1838 Macquart erected a new genus, *Eupeitenus*, for this species.

In the absence of the authors, or for other reasons, the following were read by title only:

Local Relations of Allied Species: S. A. FORBES.

On Some Terms used in Systematics: A. PETRUNKEVITCH.

A Colony of Mound-building Ants: E. A. ANDREWS.

The Conception of Unit-systems in Biology: W. E. RITTER.

Some Further Remarks on the Systematic Affinities of the Phoridæ: C. T. BRUES.

A Monographic Catalogue of the Myrmarid Genus Camptoptera Foerster, with Description of One New North American Form: A. A. GIRAULT.

Studies on Aphididæ II.: J. J. DAVIS.

A Newportia in Utah: R. V. CHAMBERLIN.

The report from the excutive committee was read and, with all its provisions and recommendations, adopted.

The executive committee announced the election of the following fellows: Samuel W. Williston, Theodore Dru Allison Cockerell, Ephraim Porter Felt, Elmer Darwin Ball, Alexander Dyer MacGillivray.

Mr. Viereck moved to ask the committee on nomenclature to define what constitutes a species and variety, taking into consideration what the ornithologists have done, and that they bring the same up before the Commission on Nomenclature of the International Congress of Zoology one year before the next meeting of that congress.

Adjournment.

At 8 P.M., in the assembly room of McCoy Hall, the annual public address was given before the society by Dr. E. B. Poulton, Hope professor of zoology in the University of Oxford, on "Mimicry in the Butterflies of North America." The speaker was introduced by Vice-president Smith. A large and appreciative audience was in attendance. The address was illustrated by many beautiful colored slides.

J. CHESTER BRADLEY,
Secretary-Treasurer

RESOLUTIONS ON THE DEATH OF DR. WM. H. ASHMEAD

William Harris Ashmead, naturalist, honorary fellow of this society, died on October 17, 1908. We, his colleagues, would hereby give expression to our sorrow in the loss of a leader and a friend —one who gave himself unsparingly to the advancement of the science we cherish, who made himself by his zeal and industry one of the foremost students of the Hymenoptera in the world, and who furthered our progress by his numerous and valuable papers and by the prompt and generous aid he lent to every student who asked his expert knowledge and assistance. We gratefully acknowledge our debt to him, and we desire to place on record this testimonial of our esteem for him as a man, our pride in his successful career, our high regard for his scientific work, and our

sincere sense of irreparable loss at his passing away.

J. H. Comstock,
J. G. Needham,
J. C. Bradley,
Committee

RESOLUTIONS ON THE DEATH OF DR. JAMES FLETCHER

Whereas, By the untimely removal of Dr. James Fletcher, the Entomological Society of America has lost—the first by death—one of its original fellows, and former vice-president, who presided at the Chicago meeting one year ago; and

Whereas, Dr. Fletcher, by reason of his nobility of character, kindness of heart and zeal, tempered by good judgment, was known and beloved among scientific men not only throughout the whole of the United States and the Dominion of Canada, but also abroad, as a careful, conscientious, scientific worker, a true Christian and a thorough gentleman; and

Whereas, His death, almost in the prime of life, is a serious loss to the applied science of entomology as well as of botany in America; therefore, be it

Resolved, That by and through these resolutions the members of this society express their grief over this loss, to two nations, of this truly fine, good man and colleague; and be it further

Resolved, That a page of the *Annals* of this society be set aside for the purpose of placing these resolutions on record and that the secretary be instructed to send a copy thereof to the bereaved family.

F. M. Webster
F. H. Chittenden
C. L. Marlatt

REPORT OF THE COMMITTEE ON NOMENCLATURE

Your committee desires to report that since its appointment, four matters have been presented for its consideration. Of these, one was the consideration of a particular case and was soon settled. The second is still under consideration; the third it has not, as yet, been able to take up, and the conclusions which the committee have reached upon the fourth case are herewith presented.

The nomenclature of gall insects was referred to the committee as the result of a paper by Dr. E. P. Felt presented at the last meeting. The committee is not unanimous on all points, but considers it desirable to present the following:

Report on the Nomenclature of Gall Insects.

In the literature relating to galls and gall insects, there are found several different kinds of description, accompanied by names.

1. Those relating to the galls only, with names intended to apply to the galls, not to their inhabitants.

2. Those relating to the galls only, but with specific names referred to particular insect genera, and intended to apply to the gall insects themselves, these being known at the time only from their work.

3. Those relating to the galls and the contained larvæ, with names proposed to be applied to the insects.

4. Those relating to the galls and the adult insects bred therefrom, and sometimes also to the larvæ, with names proposed for the insects in the usual manner.

5. Those relating to the adult insects, the galls being unknown, with names as usual.

I. It is agreed that in cases falling under 1, the names proposed do not enter zoological nomenclature. It is also obvious that in cases 4 and 5, the names are correctly proposed, and available for use if otherwise in accordance with the international rules.

II. It is the opinion of the committee that specific names based on larvæ (case 3) are available, and may be used.

III. With regard to the description of the gall, it is recognized that it forms a valuable part of the diagnosis of any gall insect, and that without it the recognition of the species may be difficult or practically impossible, especially when the description is not very detailed or precise. The committee is willing to accept a name based on the description of an adult or larva plus gall, even though the name would not be recognizable or of certain application were the account of the gall excluded from consideration.

IV. With regard to names applied as in case 2, intended to refer to the then unknown makers of known galls, it is the sense of the committee that, whenever possible, these names should be adopted.

V. The committee is not wholly in agreement as to whether it is obligatory to maintain names (if otherwise valid) proposed as in case 2; or whether, when they are maintained, the original author and date should be cited, or the author and date of the publication in which the insect itself is first described. The majority of the committee, however, is against the obligatory recognition of names accompanied by descriptions of galls only, and holds that when these are adopted, they properly enter nomenclature at the time of the description of the insect itself.

VI. The committee agrees, that whatever may be the ultimate ruling on the last point, there are many practical difficulties in the way of recognizing names proposed as in case 2, so that even were such names held to be available, many of them would have to be rejected as of uncertain application. It is perfectly clear that no rules will absolve an author from using his critical judgment in the several cases that come before him; and after the rules have declared a name available from their standpoint, it may be a long way to availability from the standpoint of practical identification.

The committee is greatly indebted to Dr. C. W. Stiles, the secretary of the International Commission on Zoological Nomenclature, for a full and luminous discussion of the matters in dispute.

H. T. FERNALD
T. D. A. COCKERELL
E. P. FELT

SOCIETIES AND ACADEMIES

THE MICHIGAN ACADEMY OF SCIENCE

THE 15th annual meeting of the academy was held at Ann Arbor, Mich., March 31 and April 1 and 2. The meeting was made the occasion of a Darwin Centenary Celebration, and the Research Club of the University of Michigan and the Michigan Schoolmasters' Club cooperated with the academy in furnishing special programs. The papers presented were as follows:

Program of the Darwin Celebration

Darwin Program of the Academy of Science.

Address of the president: "The Beginnings of Life from the View-point of a Bacteriologist," Dr. Charles E. Marshall.

"Theories of Animal Coloration, especially Warning Coloration," Professor Jacob Reighard.

"A Contribution to the Theory of Orthogenesis," Dr. Alexander Ruthven.

"American Paleontology and Neo-Lamarckism," Professor E. C. Case.

"The Mutation Theory from the Botanical View-point," Dr. Henri de Leng Hus.

The above papers were, for the most part, devoted to a discussion of the methods of evolution, from the standpoint of the original work of the speakers.

Public address under the auspices of the Research Club of the University of Michigan: "Darwinism and Paleontology," Professor W. B. Scott, Princeton University. In this lecture Professor Scott reviewed the evidence of evolution furnished by paleontology, and discussed the character of the evidence, using as illustrations the horse, camel, rhinoceros and other mammalian series.

Joint Session of the Science Teachers Section of the Academy and the Biological Section of the Schoolmasters' Club, S. D. Magers, chairman.

The Effect of the Darwin Doctrines:

"On Biology," Professor C. B. Davenport.

"On Psychology," Professor N. A. Harvey.

"On Education," President E. G. Lancaster.

"On Religion," Rev. Carl S. Patton.

As indicated by the titles, the papers presented at this meeting were concerned with the influence of the Darwinian theories upon the different fields of thought represented by the speakers.

Regular Program

Section of Agriculture, A. J. Patten, vice-president. (Held at the Michigan Agricultural College, April 14.)

"Some Reminiscences of the Attitude of Harvard Professors toward Darwin's Work," W. J. Beal.

"Darwin's Influence on Plant Breeding," H. J. Eustace.

"Darwin's Influence on Animal Breeding," A. C. Anderson.

"Further Experimental Work on the Interaction of Plant Roots," J. B. Dandeno.

"Advanced Methods in Milk Analysis," W. E. Robison.

"A Discussion of the Value of Raw Rock Phosphate for Fertilizing Purposes," A. J. Patten.

Section of Botany, Wm. E. Praeger, vice-president.

"Osmotic Theories, with Special Reference to van't Hoff's Law," J. B. Dandeno.

"Investigation on Bordeaux Mixture," J. B. Dandeno.

"The Rapid Extension of Weeds in Michigan," W. J. Beal.

"Origin of the Flora of Local Peat Bogs," Geo. P. Burns.

"The Effect of Longitudinal Compression upon the Production of Mechanical Tissue in Stems," L. H. Pennington.

"The Plasticity of Some of the Compositæ around Ann Arbor," S. Alexander.

"The Phytogeographical Relations of the Mount Ktaadn Flora," L. H. Harvey.

"Notes on Plant Pathology," J. B. Pollock.

"The Carbon Nutrition of a Fungus," Rose M. Taylor and J. B. Pollock.

"The Culture of Fern Prothallia," Elizabeth D. Wuist.

"Unreported Michigan Fungi for 1908," C. H. Kauffman.

"Methods of Sterilizing Seeds," R. de Zeeuw.

"Growth of Water Cultures in Various Solutions," N. W. Scherer.

"Variations in Leaves and Flowers," Henri de Leng Hus.

"Variations in the Dimensions of the Tracheids of *Picea excelsa*," S. M. Hamilton and W. H. Ramson.

Section of Geology and Geography, Wm. H. Hobbs, vice-president.

"The Comparison of the Loess Deposits of Europe and America," Frank Leverett.

"The Story of Niagara told in Photographs," Frank B. Taylor.

"An Ægerite-Oligoclase Aplite from the Lake Superior Region," Alfred C. Lane.

"The Differentiation toward the Most Fusible Mineral (Augite) in Non-hydrous Magmas," Alfred C. Lane.

"Occurrence of Sulphur in Sicily," W. F. Hunt.

"The Physiography of an Ancient Delta Region in Texas," E. C. Case.

"Some New Occurrences of Iodyrite," C. W. Cook.

"The Use of Crystallography in the Identification of Commercial Chemical Compounds," E. H. Kraus.

"The Iron Ranges of the Nipigon Region, Ontario," O. Bowles.

"The Iron Ores of Spring Valley, Wisconsin," R. C. Allen.

"New Apparatus for Instruction in Geology," Wm. H. Hobbs.

"The Raw Materials for Portland Cement in Alabama, together with Analyses," W. F. Cooper and Delos Fall.

"The Flint Water Supply," Alfred C. Lane and F. Harlan Bretz.

"Stadia of the Wisconsin Glaciation in North America," Frank Leverett.

Section of Sanitary Science, E. C. L. Miller, vice-president.

"Examination of a Commercial Ferment," W. E. Forsythe.

"The Standardization of Contact Insecticides," H. C. Hamilton.

"The History of the Sausage," Floyd W. Robison.

"The Organization of the Anti-tuberculosis Work," V. C. Vaughan, Sr.

"Situs Viscerum Transversus," Hugo A. Freund.

"Concerning So-called Agglutinoids," E. C. L. Miller.

"Staining of Sections by the Romanowsky Method," F. J. McJunkin.

"A Demonstration of the Effect of Alcohol on Gastric Digestion," S. D. Magers.

"Negri Bodies as a Diagnostic Factor in Rabies," Jas. G. Cumming.

"The Undetected Cases of Diphtheritic Infection of the Nose," Preston M. Hickey.

"Human Myiosis," A. W. Blain.

"The Wassermann Reaction," Jas. G. Cumming.

"Trypanosome Infection through Mucous Membranes," W. A. Perkins.

"Diagnosis Leishmania Infantum by Cultural Methods," F. G. Novy and P. A. Schule.

"Leishmaniasis," F. G. Novy.

Section of Zoology, Dana B. Casteel, vice-president.

"Notes on Michigan Reptiles and Amphibians," A. G. Ruthven.

"Notes on the Crayfish of Michigan," A. S. Pearse.

"The Early Development of Neurofibrillæ in *Rana pipiens and Ambystoma punctatum*," Hansford MacCurdy.

"Amitosis in the Nervous Tissues of Cryptobranchus," Q. O. Gilbert.

"On the Way in which Nematocysts Function," O. C. Glaser.

"Effects of Centrifugal Force upon the Embryonic Development of Some Chrysomelid Beetles," R. W. Hegner.

"The Germ Cell Determinants in Beetles," R. W. Hegner.

"Some Light Responses in the Jelly-fish, Gonionemus," Louis Murbach.

"Reaction of Amphibians to Light," A. S. Pearse.

"Method of Preserving Material for Vertebrate Dissection," J. J. Myers.

"Effects of Pressure upon the Embryonic Development of Some Chrysomelid Beetles," R. W. Hegner.

"The Distribution of the *Unionidæ* of Alabama," Bryant Walker.

"Notes on a Double Snail (*Campeloma* —)," Hansford MacCurdy.

"Notes on the Skeleton of *Chamæleon cristatus* Stutchb.," E. C. Case.

"Locality Memory in the Woodchuck," Jacob Reighard.

"Key to Michigan Gasteropods," H. B. Baker.

"Pearl Organs: A Secondary Sexual Character not Easily Explained through Use," N. H. Stewart.

Alexander G. Ruthven